



Simulating and Evaluating a Better Regulation of Converging Technologies

Project Report
14 June 2012

Document title: Simulating and Evaluating a Better Regulation of
Converging Technologies – project report

Version: Final version, 14 June 2012

Authors and
affiliations: Bernd Steffensen¹, Nicola Below¹, Peter H. Feindt⁵,
Joop de Boer⁴, Elizabeth Vogelezang-Stoute³,
Manfred Klade², Armin Spoek², Riina Pelkonen⁶,
Helena Valve⁶

- (1) University of Applied Sciences Darmstadt, Society for Institutional Analysis (sofia), 64295 Darmstadt, Germany
- (2) Inter-University Research Centre for Technology, Work and Culture (ifz), 8010 Graz, Austria
- (3) University of Amsterdam, Centre for Environmental Law (CEL), 1000 BA Amsterdam, The Netherlands
- (4) VU University Amsterdam, Institute for Environmental Studies (IVM), 1081 HV Amsterdam, The Netherlands
- (5) Cardiff University, Cardiff School of City and Regional Planning (CPLAN), Cardiff CF10 3WA, Wales, United Kingdom
- (6) Finnish Environment Institute (SKYE), 00251 Helsinki, Finland

Project title: Simulating and Evaluating a Better Regulation of
Converging Technologies (SEBEROC)

Funded by: SKEP ERA-NET (Scientific Knowledge for Environmental
Protection)

CONTENTS

CONTENTS	i
FIGURES	v
ABBREVIATIONS	vi
1 Introduction	1
2 Better Regulation	4
2.1 The relation between Better Regulation and Good Governance	5
2.2 Analysis of principles and criteria for participation in EU lawmaking.....	8
2.2.1 Good Governance Principles	8
2.2.2 General Principles and Minimum Standards for the Consultation of Interested Parties	9
2.2.3 Collection and Use of Expertise through Expert Advice	10
2.2.4 Regulatory Impact Assessment – impact assessment guideline	12
2.2.5 Smart Regulation – the role of consultations in impact assessments.....	13
2.3 Responsive Regulation	14
2.4 Better Regulation and behavioural models.....	22
2.4.1 Towards a behavioural model for Better Regulation.....	22
2.5 Reflecting behavioural assumptions: The homo oeconomicus institutionalis (hoi) framework	26
2.6 Conclusions for Better Regulation in SEBEROC	30
3 Methods of the SEBEROC approach	32
3.1 Most similar case design selection of case studies.....	36
3.2 The institutional framework	37
3.3 Telephone Interviews with national stakeholders	38
3.4 First Workshop with European stakeholders.....	38
3.5 Focus groups with consumers – comparative approach.....	39
3.5.1 Overall research questions	39
3.5.2 Theme 1: Consumer’s perception of risks and benefits	40
3.5.3 Theme 2: The role of information	40
3.5.4 Theme 3: Labelling and communication	40
3.5.5 Approach to the groups discussions.....	41
3.6 Second Workshop with EU Stakeholders	43
4 Regulatory framework in Europe	45
4.1 European Regulations on product information	45
4.2 Regulation of Genetically Modified Organisms	50
4.2.1 Specific regulations and regulatory aims	50
4.2.2 Authorisation of GMOs in food or feed	53
4.2.3 Information available to the public.....	56

4.3 Regulation of nanomaterials.....	61
4.3.1 Specific regulations, definitions and regulatory aims.....	61
4.3.2 Authorisation of nano-silver respectively nano-silver chopping boards.....	68
4.3.3 Information available to the public.....	72
4.4 The assumed contribution of the actors to the regulatory aims.....	79
4.4.1 Regulation as guideline for actor behaviour.....	79
4.4.2 Emerging versus consolidated regulatory frameworks.....	79
4.4.3 Regulatory aims.....	80
4.4.4 Relevant actors and their expected contributions.....	81
5 Country case studies	84
5.1 Germany.....	84
5.1.1 Regulatory framework.....	84
5.1.2 Market situations.....	88
5.1.3 Public debates.....	90
5.1.4 Interviews with stakeholders.....	92
5.1.5 Focus groups.....	99
5.2 Austria.....	119
5.2.1 Regulatory frameworks.....	120
5.2.2 Market situations.....	121
5.2.3 Public debates.....	123
5.2.4 Interviews with stakeholders.....	125
5.2.5 Focus groups.....	126
5.3 Finland.....	136
5.3.1 Regulatory frameworks.....	136
5.3.2 Market situations.....	137
5.3.3 Public debates.....	138
5.3.4 Interviews with stakeholders.....	139
5.3.5 Focus groups.....	143
5.4 The Netherlands.....	157
5.4.1 Regulatory frameworks.....	157
5.4.2 Market situations.....	160
5.4.3 Public debates.....	162
5.4.4 Interviews with stakeholders.....	166
5.4.5 Focus Groups.....	171
5.5 United Kingdom.....	193
5.5.1 Regulatory frameworks.....	193
5.5.2 Market situations.....	199
5.5.3 Public debates.....	204
5.5.4 Interviews with stakeholders.....	208
5.5.5 Focus groups.....	215
6 Comparison between the countries	226
6.1 GMO.....	226

6.1.1	Regulatory frameworks.....	226
6.1.2	Market situations.....	226
6.1.3	Public Debates.....	228
6.1.4	Views of national stakeholders.....	229
6.1.5	Views of the consumers.....	237
6.2	Nano.....	244
6.2.1	Regulatory frameworks.....	244
6.2.2	Market situations.....	244
6.2.3	Public Debates.....	245
6.2.4	Views of national stakeholders.....	246
6.2.5	Views of the consumers.....	253
7	Comparison of the findings between the technologies.....	262
7.1	Regulatory frameworks.....	262
7.2	Market situations.....	262
7.3	Public Debates.....	263
7.4	Views of national stakeholders.....	263
7.5	Views of consumers.....	264
7.5.1	Perception and knowledge about the technologies.....	264
7.5.2	Purchasing criteria.....	265
7.5.3	Consumer information.....	265
7.5.4	Responsibility of actors.....	266
7.5.5	Conclusion.....	267
8	The views of EU stakeholder.....	268
8.1	First workshop with stakeholders in Brussels.....	268
8.1.1	Regulatory objectives.....	269
8.1.2	Precautionary principle and nanotechnology.....	272
8.1.3	The role of nano-related consumer information.....	273
8.1.4	The role of participation.....	274
8.2	Second workshop with stakeholders in Brussels.....	275
8.2.1	Research design.....	276
8.2.2	Discussion of the findings from the project.....	277
9	Conclusions.....	282
9.1	Regulatory aims of consumer information regulation.....	282
9.2	Viewpoints of EU stakeholders.....	284
9.3	Viewpoints of national stakeholders.....	285
9.4	Interim conclusions on different consumer and stakeholder viewpoints.....	287
9.5	Consumer viewpoints.....	287
9.6	A typology of European consumers – towards a differentiated model of consumer behaviour.....	288
9.6.1	Fatalist consumer.....	288

9.6.2 Informed consumer	289
9.6.3 Citizen-consumer	290
9.7 Informational and regulatory needs of the different consumer types .	291
9.7.1 Health and safety regulation.....	292
9.7.2 Well-explained labels.....	292
9.7.3 Background information.....	294
9.7.4 Two-channel communication	294
9.8 Participation.....	295
9.8.1 Consumer participation	296
9.8.2 Participation of national stakeholders	297
9.8.3 The SEBEROC experience.....	297
10 Critical remarks and further research questions.....	302
11 Policy recommendations.....	304
11.1 Technology-related consumer information.....	304
11.2 Accompanying information	306
LITERATURE	ix
LEGAL ACTS	xxviii
APPENDIX I: Interview guidelines	xxx
APPENDIX II: Focus groups guidelines	xxxix

FIGURES

Figure 1: Different stages of consultation possibilities and interplay between collection and use of expertise and consultation of interested parties (taken from European Commission 2002d, 8).....	12
Figure 2: A simplistic model of political intervention (Source: SEBERROC team).	22
Figure 3: A model of regulation as macro-micro-macro interaction (Source: SEBERROC team).....	23
Figure 4: A model of regulatory intervention including implementation and consultation (Source: SEBERROC team).....	25
Figure 5: The SEBERROC-approach to Better Regulation (Source: SEBERROC team).	26
Figure 6: The oeconomicus institutionalis framework (Source: Führ Bizer Feindt 2007, 23).	27
Figure 7: GMO free label used in the focus groups	42
Figure 8: nano label used in the focus groups	42
Figure 9: Example for GMO labelling "contains genetically modified..."	59
Figure 10: Official organic farming logo of the European Union	60
Figure 11: Pictogram for FCMs	77
Figure 12: Hohensteiner quality seal on nanotechnology.....	87
Figure 13: Nano inside label from forumnano	88
Figure 14: Results of UK Government Consultation (POST 2004, pp. 1-2) ..	205
Figure 15: Eurobarometer survey on Biotechnology 2010, values in percent	229
Figure 16: Distribution of the interviews with regard to the field of action of the stakeholder organisations.....	230
Figure 17: Number of groups and participants per country	237
Figure 18: Eurobarometer survey on Biotechnology 2010, values in percent	246
Figure 19: Distribution of the interviews with regard to the field of action of the stakeholder organisations.....	247
Figure 20: Number of groups and participants per country	254
Figure 21: Regulatory objectives and their ranking	271
Figure 22: Information/regulation pyramid based on information	291

ABBREVIATIONS

AIM	Active and intelligent materials
Apps	Discussed in the context of smartphone applications; a programme running on a smartphone
Art.	Article
AT	Austria
BPD	Biocidal products directive
BPR	Biocidal products regulation
cm	Centimetre
COM	European Commission
CSO	Civil society organisation
DE	Germany
DG	Directorate General
e.g.	For example
EC	European Community
ECHA	European Chemicals Authority
EFSA	European Food Safety Authority
EINECS	European Inventory of Existing Commercial chemical Substances
et seq.	And the following (pages or items in a list)
EU	Europe; European; the European Union
FCM	Food contact materials
GM	Genetically modified
GM soy	Genetically modified soy
GMO	Genetically modified organism
HOI	Homo oeconomicus institutionalis
IA	Impact assessment
ISO	International standardisation organisation
IUPAC	International Union of Pure and Applied Chemistry
mg/kg	Milligram per kilogram
MS	Member states
Nano	Nano-related; nanomaterials
Nano-silver	Nano-sized silver

NGO	Non-governmental organisation
NL	The Netherlands
nm	Nanometre
No	Number
OECD	Organisation for Economic Co-operation and Development
OJ	Official Journal
p.	Page
PIM	Plastic materials intended to come into contact with food
PNEC	Predicted no effect concentration
resp.	Respectively
RIA	Regulatory impact assessment
SCM	Standard cost model
SEBEROC	Research project acronym
SF	Finland
TIA	Technology impact assessment
UK	The United Kingdom
US	United States of America
UV	Ultra-violet
w/w	Weight by weight
µm	Micrometre

1

Introduction

The aim of the research project SEBEROC is to test a novel robust method of information dissemination, public engagement and participation in the management and regulation of

- genetic engineering and
- nanotechnology.

The third SKEP-call targeted converging technologies. The findings of the SEBEROC-project will be transferable to converging technologies although they focus the two technologies aforementioned. The project took a special view on human health and environmental impacts deriving out of everyday products, which are handled by consumers.

Since the convergence of the two technologies is still in its infancy and products are not yet released to the market, a retrospective regulatory impact assessment of the regulation of genetic engineering and a prospective regulatory impact assessment of the currently emerging nanotechnology was carried out. The different findings of the case studies were compared to allow for deeper insights in the framework conditions regulation have to cope with when these technologies will converge in the future and have an impact on the public.

Moreover, the project aimed particularly at applying the “Better regulation” approach to this special case of the regulation of converging technologies. In this context “Better regulation” is not only taking into account the reduction of red tape, but also applies the broader understanding of good governance. Whereas, the first understanding of “Better regulation” merely takes into account economic impacts, the latter explicitly aims at balancing economic, social and environmental impacts of regulations. This enables decision makers to come to a well-balanced set of regulatory options and to take well-informed decisions.

The environmental and health impacts from a product fabricated with the help of new technologies or directly containing new technologies substances depend on the ways this product is being handled by the actors along the product chain, including the consumer/end-user. Therefore, knowledge and perception of all groups handling these novel products, including consumers, should be considered when drafting, evaluating or amending regulatory approaches. In particular, effects from the use of such products will probably mainly occur in consumers’ environments.

- This is particularly true in the case of nano-silver which is increasingly used in consumer products, e.g. washing machines, textiles or food packaging. While nano silver serves as antibacterial agent in the prod-

ucts mentioned. Still unknown is which environmental or health effects are related to the extensive use of this nano material.

- The link to consumer behaviour is more indirect in the case of GMO-feed. Here GMOs are part of the feed of cattle. From a scientific point of view, these GMOs (soy) won't become part of milk, meat, eggs or fish. But consumers might have this impression which might lead to an avoidance of these products. On the other hand the avoidance of GMO-soy would lead to a protein-gap in the EU.

Especially the information on nanotechnology risks and opportunities, and the proper handling of related products has to reach out to consumers in order to give them the opportunity to take a stand and deal with this technology. There are different ways how to inform the population, but the most suitable approach will depend on the informational behaviour of the individuals. So it must be taken into account that European consumers living in different informational and regulatory settings might have different strategies and routines of staying informed and they might also have different levels of risk awareness which also must be taken into account when providing information.

Therefore, the research design was informed by the concept of responsive regulation that pays particular attention to the ways actors and consumers respond to regulation and handle products due to the incentive structure and/or routine behaviour. The heart of the project were focus groups which were organized and carried out in Austria, Finland, Germany, the Netherlands and the United Kingdom. The specific topics which were addressed in the focus group discussions were discussed and defined together with representatives from Non-governmental organisations (NGO) acting on the national and the EU-level.

NGOs are important promoters for economical, social or environmental interests. They are certainly not the only ones, but they can act as a political agent bringing in and amplifying the interest of the public in regulatory approaches to converging technologies. The interests of the civil society as organised in non-governmental organisation will have to be taken into account by the legislator to ensure good quality consultation in the impact assessment process. Therefore, the citizens' practical handling of the targeted technologies has to be considered in the consultation-process for their regulation. The results of the focus group discussion are used to support NGOs in the process of political negotiations in order to strengthen the stake of consumers or citizens and to come to a more suitable regulation.

The results of the SEBEROC-project are presented and discussed in this report. We like to thank the representatives of the funding institutions for supporting the project team: Especially Vera Rabelt, Karen Thiele and Kerstin Döscher (Federal Environment Agency, Dessau, Germany); Erich Ober (Federal Ministry of Agriculture, Forestry, Environment and Water Management ["Life Ministry"], Wien, Austria); Dick van Lith (Ministry of Housing, Spatial Planning and the Environment; now Ministry of Infrastructure and the Environment, The Hague, The Netherlands); Jyrki Pitkälä (Ministry of the Environment, Helsinki, Finland) and Jon Greaves (SKEP-secretariat, Bristol, United Kingdom).

2 Better Regulation

The SEBEROC project contributes to wider debates about “better regulation”. The term has a wide range of connotations and is linked to different political initiatives at the EU and member state level (Jacob et al. 2008). For example, the UK Government launched its Better Regulation Task Force as early as 1997. Among all variation, three areas of concern can be distinguished establishing the core of the better regulation discourse (Radaelli and Meuwese 2009): more systematic use of evidence in the regulatory process; increasing competitiveness by reducing regulatory costs and avoiding unnecessary or inefficient regulatory burdens; and addressing legitimacy problems through more transparent and open procedures and a more systematic approach to participation.

These general issues in regulation are exacerbated in the area of converging technologies. Here, the novelty of the processes, materials and products generates uncertainty and ignorance about effects which challenge the underlying assumptions of evidence-based policy-making. The high degree of innovation increases the competitiveness stakes. And the novelty of the technologies can make it sometimes difficult to identify stakeholders or to gather informed opinions from citizens who are not yet accustomed to the technology or the new products.

The SEBEROC project approaches these linked challenges from a behaviour-oriented perspective. Based on theories of responsive regulation (Ayres and Braithwaite 1995; Bizer, Führ, and Hüttig 2002), we suggest that better regulation needs to put the behavioural responses to regulation right at the centre of regulatory deliberation – this includes responses to legal norms, economic incentives, informal expectations and information from various sources. A responsive regulation approach hence resonates with governance theories which take a broad look at a wide range of social mechanisms that influence behavioural patterns (e.g., Arts and Leroy 2006; Bäckstrand et al. 2010; Jessop 2003; Schuppert 2006). A systematic inquiry into potential or actual regulatory impact requires a reflective and empirically grounded approach to the behavioural assumptions underlying regulatory initiatives (Führ and Bizer 2007; Führ, Feindt, and Bizer 2007). For example, behavioural responses to information depend on the prevailing preferences, values and context-specific associations. For novel technologies and products, such responses might be difficult to predict, or very fluid, or dominated by individual strategies to deal with uncertainty and ignorance.

This chapter reviews the context for the specific approach taken in the SEBEROC project.

The analysis carried out in this chapter will serve the purpose to collect criteria which needs to be considered for the SEBEROC-specific cases of regulatory impact assessment in emerging technologies product information regulation with a special view on consumers and will then form the theoretical basis for the design of the method of gathering information from the stakeholders (consumers/NGOs) via consultation. The general underlying assumption can be summarized as follows: successful intervention of political actors (law making as well as administrative interaction) has to consider motives and strategies of those who are subject to restrictions or a requested behavioural change.

The next section discusses the relationship between European Governance and Better Regulation, with a particular focus on relevant developments in European regulatory policy, access points and consultation requirements. Subsequently, we revisit the literature on responsive regulation. This is followed by a more in-depth discussion of the behavioural model of Homo Oeconomicus Institutionalised and the “multi-step-heuristic” for impact assessment that constitutes the conceptual base of the SEBEROC approach. Finally, we apply the conceptual framework to develop criteria for a sound consultation process.

2.1

The relation between Better Regulation and Good Governance

Over the last 15 years, the governance debate has widely reflected on the limits to traditional hierarchical approaches to influence behavioural patterns. As the result of a wide range of developments, such as internationalisation, globalisation, increasing social complexity or the differentiation of societal actors, regulators often find their ability to exercise hierarchical control limited (e.g., Tömmel 2008, 16 and Stobbe 2011). In response, new policy instruments – based on economic incentives, information or voluntary agreements – have been widely established alongside the previously established, more hierarchical, ‘command-and-control’ policy instruments such as standards and regulations (Jordan, Wurzel, and Zito 2007). Often these instruments are now combined to improve goal attainment.

The processes of policy formulation have also become more complex with ongoing processes of deliberation and negotiation processes between state agencies, private sector and civil society. The European Commission reflected on these developments in its White Paper on European Governance (European Commission 2001a and European Commission 2002a) in an attempt to improve the inclusiveness and transparency of European policy-making and to address a widely perceived democratic deficit in Europe.

In this document, the Commission also embraced the “Better Regulation” approach with a strong focus on participation in the regulatory process. This was also partly a response to a number of EU-related food scandals and blatant cronyism associated with the “Santer Commission”, which had undermined public trust in the European institutions (Löfstedt 2006, 240).

The Commission White Paper defines “Governance” broadly and includes process and outcome standards:

““Governance” means rules, processes and behaviour that affect the way in which powers are exercised at European level, particularly as regards openness, participation, accountability, effectiveness and coherence.” (European Commission 2001, 8)

This definition is meant to cover all management and regulation activities of all European institutions. The quality criteria have become known as the five principles of European “Good Governance” (to be discussed later).

The Communication on “European Governance: Better Lawmaking” from the European Commission (European Commission 2002c) linked the themes of “Good Governance” and “Better Regulation” and transferred the five principles of Good Governance to legislation (see also Radaelli Meuwese 2009, 642). The paper linked the issues of governance, legitimacy and competitiveness and coined the regulatory reform agenda throughout Europe (Radaelli Meuwese 2009, 639). The agenda for “Better Lawmaking” included simplification and improvement of the regulatory environment, setting up a culture of dialogue and participation, and systematic impact assessments through the adoption of impact assessment guidelines.¹ Under this agenda, a variety of tools have been applied in the regulatory process (taken from Radaelli Meuwese 2009, 640):

- Regulatory Impact Assessment (RIA), Cost-benefit analysis and quantification tools for the assessment of administrative burdens through the Standard Cost Model (SCM).
- Simplification programmes.
- Methods to foster market-based alternatives to traditional regulation.
- Techniques for the choice of regulatory instruments.
- Consultation standards (including notice and comment procedures).
- Risk-based approaches to enforcement and inspections.

¹ See European Commission (2002), p. 2f. It refers to three Communications: [1] Action plan “Simplifying and improving the regulatory environment”, COM(2002) 278, [2] Towards a reinforced culture of consultation and dialogue - General principles and minimum standards for consultation of interested parties by the Commission, COM(2002) 704 final, and [3] European Commission, On Impact Assessment, COM(2002) 276 final.

- Ex-post evaluation of regulations.

However, “regulation” has always two dimensions: First, how should a subject be regulated and, second, who is the subject of regulation? The debate about Better Regulation is mainly concerned with the first question. The OECD defines regulation as “diverse set of instruments by which governments set requirements on enterprises and citizens” (Wegrich 2009, 18). Regulation can therefore be

- Regulative programmes (steering through regulations);
- incentive programmes (steering through money);
- persuasive programmes (steering through information or conviction);
- provisioning of goods, services or infrastructure (performance programmes); and
- establishing of binding procedural rules (procedural controls; see Wegrich 2009, 19).

Questions about the subject of regulation have become more prominent in the more recent debates about “Smart Regulation” (European Commission 2010). Here, the focus is more explicitly on the appropriate combination of public/government and private (self-)regulation. In this context, it is useful to distinguish the following different types of regulation along a continuum:

- classic regulation (command and control regulation);
- co-regulation;
- regulated self-regulation (meta-regulation); and
- self-regulation (see Wegrich 2009, 20).

Against this background, it has been suggested that “Better Regulation” is primarily meta-regulation. Its aim is to regulate the process of rule-making or legislation to achieve better outcomes (Wegrich 2009, 43 et seq. Radaelli 2009, 89). Such an approach would address the entire life cycle of regulations, by introducing rules on how regulations are formulated, appraised, enforced, implemented, evaluated and eventually terminated. In recent years, the Commission’s understanding of “Better Regulation” clearly emphasised the simplification of legislation with a view to reducing administrative burdens for business (European Commission 2009, 1). The ambivalence of the term “Better Regulation” has allowed to use it merely as another term for deregulation or risk-tolerant deregulation, but also to address regulatory quality and effectiveness (cf. Radaelli/Meuwese 2009, 640).

Both the “Better Regulation” and the “Good Governance” are clearly relevant for development of impact assessment procedures and their consultation element is particularly important for the assessment of social and environmental impacts. The governance discourse reflects an ongoing reorientation of cooperation and coordination mechanisms between the public, private and civil

society sector (Wegrich 2009, 74). It is therefore useful to take the basic principles of “Good Governance” into account assessing and improving the arrangements and practices for regulatory consultation with stakeholders.

2.2

Analysis of principles and criteria for participation in EU lawmaking

The following sections analyse the requirements of European Good Governance and Better Regulation applied by the European Commission.

2.2.1

Good Governance Principles

Effective regulation needs a clear institutional framework. For this purpose the European Commission embraced five principles of “Good Governance” in its 2001 White Paper (see European Commission 2001a, 10):

- Openness: The Institutions should work in a more open manner. Together with the Member States, they should actively communicate about what the EU does and the decisions it takes. They should use language that is accessible and understandable for the general public. This is of particular importance in order to improve the confidence in complex institutions.
- Participation: The quality, relevance and effectiveness of EU policies depend on ensuring wide participation throughout the policy chain – from conception to implementation. Improved participation is likely create more confidence in the end result and in the Institutions which deliver policies. Participation crucially depends on central governments following an inclusive approach when developing and implementing EU policies.
- Accountability: Roles in the legislative and executive processes need to be clearer. Each of the EU Institutions must explain and take responsibility for what it does in Europe. But there is also a need for greater clarity and responsibility from Member States and all those involved in developing and implementing EU policy at whatever level.
- Effectiveness: Policies must be effective and timely, delivering what is needed on the basis of clear objectives, an evaluation of future impact and, where available, of past experience. Effectiveness also depends on implementing EU policies in a proportionate manner and on taking decisions at the most appropriate level.
- Coherence: Policies and action must be coherent and easily understood. The need for coherence in the Union is increasing: the range of tasks has grown; enlargement will increase diversity; challenges such as climate and demographic change cross the boundaries of the sectoral policies on which the Un-

ion has been built; regional and local authorities are increasingly involved in EU policies. Coherence requires political leadership and a strong responsibility on the part of the Institutions to ensure a consistent approach within a complex system.

Overall the principles tend to pull into slightly different directions. While the first two principles are process and input-oriented and call for more involvement of various governmental and non-governmental actors, the third principle balances the potential blurring of responsibility and the fourth and fifth principle are output-oriented. The resulting tensions and trade-offs mean that an overall balance needs to be struck, but also that there is some room for debate about the relative weighting of the five principles. The White Paper pays special attention to evidence and expertise in the regulatory process. With a reference to biotechnologies, the Commission integrates into its notion of "expert advice" the "need to collect a wide range of disciplines and experiences beyond the purely scientific" (European Commission 2001, 19), but the White Paper does not explicitly state at what stage of the policy process to include a wider range of experiences. However, the Commission White Paper recognized that the public might perceive scientific as being not per se independent, and this issue becomes more acute when the EU is required to carry out risk assessments and agree on risk management measures.

The five principles of "Good Governance" were further developed into special sets of principles for the special purposes and will be further described in these contexts.

2.2.2

General Principles and Minimum Standards for the Consultation of Interested Parties

In a Communication in 2002 the Commission set up general principles and minimum standards for the consultation of interested parties to "ensure that all relevant parties are properly consulted" (see European Commission 2002e) and that policy makers take into account the arguments from different point of views. For this purpose different civil society organisations are accredited to the consultation or dialogue process, for instance, labour market players, organisations representing social and economic players, NGOs, community-based organisations and others. The Communication contributed to the "Action Plan for Better Regulation" and the new approach to (regulatory) impact assessment. The principles were meant to form the basis for any further development of European consultation policies (European Commission 2002e, 15). The principles are:

1. Participation:
The Commission is committed to an inclusive approach and should consult as widely as possible.
2. Openness and Accountability:
Administrative processes and policy-making should be visible, understandable and credible for those who are involved, but also for the public at large, especially when society interests are involved.
3. Effectiveness:
Consultations must start as early as possible to give interested parties the opportunity to effectively influence the formulation of the regulatory aims, methods of delivery, etc. Here, proportionality plays a major role. The efforts to consult should therefore be proportionate to the tasks at hand.
4. Coherence:
Consultation processes shall be transparent and consistent and subject to evaluation. Reports are foreseen in the frame of “better law-making” activities, which are also known as “Better Regulation” activities.

The general principles and requirements target not only the EU institutions, but also ask stakeholder groups engaging in a consultation process to apply these principles to their work. However, the principles and standards are quite vague (European Commission 2002e, 15 and Obradovic Vizcaino 2006). They only pertain to the drafting stage of a regulation while formal decision-making procedures are reserved to the institutions (the Commission, the Parliament and the Council including the comitology system). Consequently, the participation process is politically sensitive endeavour which has to balance different and sometimes conflicting aspirations.

The urge for participation is, however, limited as long as a proposal cannot be challenged in court on the basis of lack of consultation. Furthermore, minimum standards for civil society groups – representativeness, openness and accountability – can be restrictive; they demonstrate an attempt to transfer legitimacy from the participants to the regulatory outcome. However, the requirements are not meant to bar relevant groups from being heard. The inclusion of non-organized interests can be appropriate on a case-by-case base, often regional, local and minority viewpoints can be important to be considered (see Obradovic Vizcaino 2006, 19 and European Commission 2002e, 12). In any case, it is left to the institutionalised decision-makers to decide which inputs to take into account in their final regulation.

2.2.3

Collection and Use of Expertise through Expert Advice

Besides the general principles and minimum standards for consultation of interested parties of 2002, the Commission addressed the collection and use of

expertise in the Communication “Improving the knowledge base for better policies”, setting up principles and guidelines (European Commission 2002d). These principles apply to all stages of Commission policy-making.² Three components are stated in the Communication: First, the core principles of quality, openness and effectiveness should be upheld, second, a set of guidelines³ should be used to help the departments implement the principles, and third, a set of practical questions should support design methods for collecting and using expert advice appropriate for the specific case. Especially in cases where scientific assessments are highly controversial, the interplay between policy-makers, experts, interested parties and the public at large needs to be designed carefully to increase acceptance of the final decision. Besides the policy outcomes, a credible process of policy-making becomes an aim in itself.⁴

To realise the principles, the quality of expert advice needs to be of appropriately high level. Besides the excellence of independent experts, a plurality of views should be collected. Depending on the issue and the stage in the policy cycle a multi-disciplinary and multi-sectoral expertise should be considered, which also includes (where appropriate) minority and non-conformist views, as well as a variety of geographical, cultural and gender perspectives.

The principles also require the Commission to promote openness when seeking or acting on advice from experts. This calls for proactive communication with interested stakeholders and the public at large in an understandable and non-specialist way. This principle also applies to a certain extent to the experts as long as openness is not detrimental to the quality of expert advice, or may damage legitimate interests of those concerned in the process. The balance between openness and legitimate confidentiality claims can be a delicate one. The Commission therefore reserves itself the secondary principle that openness should be proportionate to the tasks. However, where issues are controversial, determining the appropriate degree and practices of openness can become a highly contested and political question.

² Especially, when Commission departments collect and use advice of experts coming from outside the responsible department (European Commission 2002d, 7).

³ These guidelines were developed further under the term “Better Regulation”, see also chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**

⁴ The Communication cites the GMO-case as an example (European Commission 2002d, 3).

The Commission applies the notion of proportionate application of its principles also to the principle of effectiveness in an attempt to address the problem of its limited resources. However, in “sensitive cases, when the underlying science may be highly uncertain and when also the ‘stakes are high’ in terms of the political, social, economic or environmental consequences of an eventual policy decision” (European Commission 2002d, 10), the methods need thoroughly address the issues at hand to be adequate. Holding the monopoly on formal legislative initiatives, the Commission can also de facto decide how to apply the principle of effectiveness in allocating resources for participation and external advice. The guidelines and the practical questions stated in the Communication were meant to contribute to the European Commissions Better Regulation Action Plan (European Commission 2002d, 4).

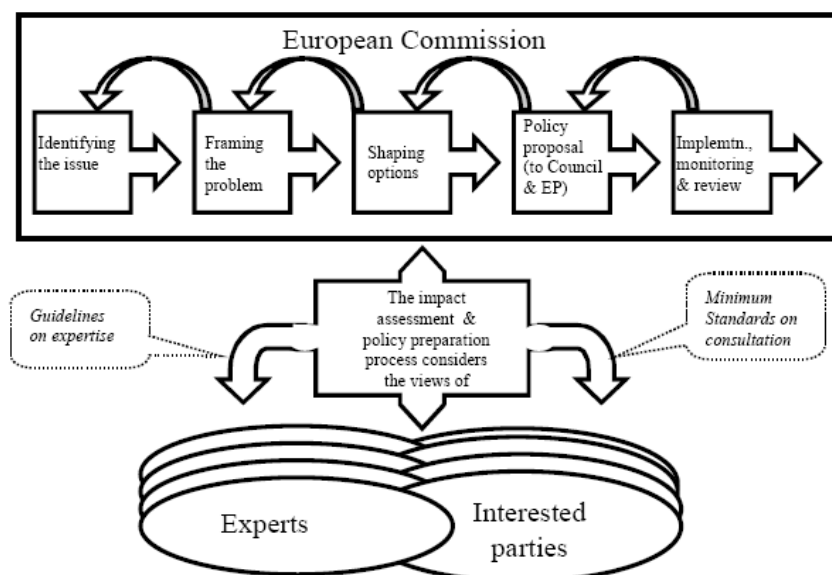


Figure 1: Different stages of consultation possibilities and interplay between collection and use of expertise and consultation of interested parties (taken from European Commission 2002d, 8).

Figure 1 shows the interplay of the processes stated in the two Communications on the collection and use of expertise and consultation of interested parties are working together.

2.2.4

Regulatory Impact Assessment – impact assessment guideline

In 2002 the European Commission published a Communication on Impact Assessment, which is also part of the Better Regulation Action Plan (European

Commission 2002b). According to this Communication, core principles and a uniform method of assessing the direct and indirect impacts of legislation were introduced on European level through guidelines. Impact assessment should therefore be an open and transparent process, which should make decision-makers and the public aware of the likely impacts of regulation under consideration. It is a communication tool, which includes consultations with interested parties in an attempt to collect a broad range of views.

The current impact assessment guidelines (European Commission 2009c) assert minimum standards for participation, including the gathering of information and consultation with stakeholders. According to the Guidelines, consultations are mandatory and should be carried out at an early stage of the drafting of a legislative proposal. A consultation plan should be drafted that covers the whole policy-making process and includes information on (see European Commission 2009c, 19):

- the objectives of the consultation(s), for example: finding new ideas (brainstorming); collecting factual data; validating a hypothesis, etc.;
- the elements of the impact assessment for which consultation is necessary, e.g. the nature of the problem, aspects of subsidiarity, objectives and policy options, impacts, comparison of policy options;
- the target groups: general public, a specific category of stakeholders or designated individuals/organisations;
- the appropriate consultation tool(s): consultative committees, expert groups, open hearings, ad hoc meetings, consultation via Internet, questionnaires, focus groups, seminars/workshops, etc.;
- the appropriate time for consultations: these should start early but can run at intervals throughout the impact assessment process.

The information gathered through consultation should be carefully evaluated. The guidelines advice to distinguish evidence and opinions. Stakeholder consultation is also addressed in the Annexes of the Impact Assessment Guidelines, calling for *inter alia* direct consumer participation via focus groups and Eurobarometer surveys (European Commission 2009d, 16)).

2.2.5

Smart Regulation – the role of consultations in impact assessments

In 2010 the European Commission rebranded its Better Regulation initiative as “Smart Regulation” (European Commission 2010). The Commission’s “Communication on Smart Regulation in the European Union” stresses the principles of proportionality and subsidiarity; it also emphasises that smart regulation pertains to all stages of the policy cycle, requires shared responsibility by

EU and member states institutions and reserves a “key role” to the view of those “most affected by regulation”.

More specifically, the consultation period for impact assessment was extended from 8 to 12 weeks (European Commission 2010). The Commission admits that a cost-benefit assessment is often difficult if the social or environmental impacts are not readily quantifiable or depend on the implementation practices at the national level (McColm 2011, 9 and Allio 2011, 19).

The Smart Regulation agenda stresses effectiveness of regulation and its overall quality. Besides an improved assessment of social impacts including fundamental rights, reducing regulatory burdens is still an important target. It is in this context that consultation procedures are emphasised, especially of small and medium sized enterprises and non-governmental organisations representing vulnerable stakeholders and citizens (McColm 2011, 10).

To summarise, the Better/Smart Regulation agenda has continuously evolved over more than a decade. General concerns about the effectiveness and efficiency of regulation are matched by questions about the proportionality and subsidiarity of European regulation. The strategy has been to improve the evidence base for regulatory initiatives along two lines: elaboration of scientific methods for impact assessment, and a more systematic approach to stakeholder participation. Better/Smart Regulation has also extended the scope of concern to all elements of the policy cycle, from problem discovery and policy formulation to implementation and evaluation.

The next section turns to the “responsive regulation” approach, which stresses how assumptions about behavioural responses to policy measures are important for regulatory impact assessment.

2.3 Responsive Regulation

The concept of responsive regulation has been established in the mid 1990s in an attempt to bridge the ineffective debates between advocates of strong hierarchical regulation and free-market deregulation (Ayres and Braithwaite 1995, 2). Building on a richer empirical understanding of the role of private self-regulation and of public-private co-regulation for the working of markets, the concept of “responsive regulation” marks up the development of a meta-regulatory theory (Ayres and Braithwaite 1995, 4)

The basic idea of responsive regulation is a more context-sensitive approach to rule-making:

“We suggest that regulation be responsive to industry structure in that different structures will be conducive to different degrees and forms of regulation. Government should also be attuned to the diverse objectives of regulated firms, industry associations, and individuals within them. Regulations themselves can affect structure (e.g., the number of firms in the industry) and can affect motivations of the regulated.” (Ayres and Braithwaite 1995)

Furthermore, regulation should respond to industry conduct and develop innovative approaches where delegation of regulation is more conducive to achieving public policy goals (*idem*).

The concept of responsive regulation developed against the background of a sobering empirical assessment of established regulation:

“... instruments used (laws backed by sanctions) are inappropriate and unsophisticated (instrument failure), ... government has insufficient knowledge to be able to identify the causes of the problems, to design solutions that are appropriate, and to identify non-compliance (information failure), ... implementation of the regulation is inadequate (implementation failure) and/or those being regulated are insufficiently inclined to comply (motivation failure).” (Black 2001, *Decentring Regulation*, op. cit. by Ramsay 2006, 10)

The ideas developed in the responsive regulation debate resonate with the discussion on the changing role of the state in regulation which has often been described as move “from government to governance” (e.g., Rosenau and Czempiel 1992; Borrás 2003). However, while “governance” looks at the wider constellations of decision-making and systematic steering of patterned behaviour, responsive regulation is more specifically concerned with the relative merits of various regulatory arrangements.

The European Commission White Paper on European “Good Governance” (2001) is clearly embedded in the unfolding discussions about the changing conditions for successful regulation.. Authors like Luhmann, Willke and Teubner have argued that social sub-systems such as economic sectors, science, medicine etc. increasingly develop their own differentiated logics of operation, based on legally guaranteed degrees of autonomy. Sceptics of state-led interventions have therefore argued that regulation increasingly runs a risk of disrupting functional logics of operation of sub-systems or to the contrary of sending signals which are meaningless for the specialised operational communication and routines in differentiated sub-systems (e.g., Luhmann 1986). Willke (1997) has therefore argued that the state needs to act as a “supervisor”, ensuring that functionally specialised organisations do not ignore or become blinded for the external effects of their operations.

While this line of argument is highly stylised, it makes an important contribution to the debate on responsive regulation in that it highlights the possibility

that specialised patterns of communication can render regulatory signals incomprehensible to the regulatory targets. The context-sensitivity of responsive regulation must therefore extend beyond the material interests and motivations and include the dominant normative and evaluative orientations held by the targeted actor groups and organisations. Using a neo-institutional framework, March and Olsen (1989) make a similar argument in stressing the importance of norms of appropriateness in organisations – which of course differ between organisational contexts but influence how regulatory measures are responded to at the organisational level. Perceived appropriateness of regulation becomes an even more urgent concern where the aim is not merely the interdiction of specific patterns of behaviour but when active cooperation of regulated actors is necessary for success (Führ Feindt Bizer 2006, 9). In general attempts at regulation are launched when influential actors or groups identify a given state of affairs as problematic. In many cases, however, the state cannot directly or unilaterally achieve the desired changes, for example less energy intensive patterns of consumption and production or the hiring of more employees to reduce unemployment. In these cases the realisation of public policy goals depends on contributions by third parties. Where it is not possible or desirable to enforce behavioural change incentives, legitimacy, information, monitoring and informal norms become essential. Increased efforts at participation and consultation in the regulatory process are part of governance processes under such circumstances. They can in particular help to enhance the perceived legitimacy, share and assess information and build trust and informal norms supportive to the achievement of public policy goals.

“Responsive Regulation” has been particularly concerned with compliance and the reduction of implementation deficits:

“Rules and standards tell people and companies how to behave, and public agencies and their employees control and of course react if people do not comply. The purpose is to make sure that people and companies behave in the way that has been politically defined as preferable. The ultimate goal throughout the process is: Compliance with the law without spending too many resources enforcing it – in other words efficiency.” (Nielsen 2006: 396, with a similar notion: Hampton Report 2005)

Nielsen (2006) suggests that “Responsive Regulation” proposes a tit for tat strategy to achieve desired behaviour. Rule enforcement is then understood as regulator response to firm or individuals’ behaviour and not as quasi-automatic application of written rules. Enforcement implies interaction between the representatives of agencies and firms (see Nielsen 2006) which leads to a modified enforcement process in each the setting and the sequence of events depends on how the regulated entities respond to rules and previous enforcement measures. This suggestion of individually designed pathways

of enforcement leads to criticism "... on the grounds of fairness, proportionality and consistency" (Baldwin Black 2008, 64) because different regulatees are treated differently. Ayres and Braithwaite (1992, 39) suggest a more complex view on these principles and devise a pyramid of enforcement strategies – one could also say an escalation plan – to be selected appropriate to the situation in the individual case. The authors suggest to start with relatively soft instruments to motivate the regulated entity to comply and to intensify enforcement measures in case of continued non-compliance:

"As we move up the pyramid, more and more demanding and punitive interventions in peoples' lives are involved. The idea of the pyramid is that our presumption should always be to start at the base of the pyramid, then escalate to somewhat punitive approaches only reluctantly and only when dialogue fails, and then escalate to even more punitive approaches only when the more modest forms of punishment fail." (Braithwaite 2002, 20).

Enforcement in this sense is a simple rule application but the result of an interpretation of the situation, the expectations and the strategies⁵ of the regulated in order to select suitable measures. In other words, coercive administrative intervention is a very last mean when persuasion and incentives have failed.

Much research on responsive regulation focuses on policies which are characterized by a well established interaction between regulatory bodies and regulated entities (in most cases firms). Ayres and Braithwaite (1992, 54 et seq.) use game theory to explain the strategic interdependence and the reasons why strict enforcement measures are necessary in some cases and 'soft' instruments in others. However, while game theory can explain typical situations, administrative life shows a great variety of approaches to enforcement. To explain this variety, context variables have to be recognized which differ from case to case. These are stressed by the approach of Smart Regulation again a term we already mentioned in the section before:

"Central to the descriptive analytical perspective is the idea that regulated bodies do not respond in a neutral manner 'to signals of regulatory agencies,' nor do they operate 'in a vacuum when thinking about their actions' (...). Regulated bodies are always embedded in contexts that significantly influence their needs and compliance motivations." (Wright Head 2009, 202)

Baldwin and Black (2008, 70) express a similar idea:

⁵ In many of the approaches and theoretical work ideas from game theory are included to highlight the strategic character of interaction. It is not pure obeying the law or refusing to obey the law. At the heart of this decision is a strategy which is canalising the course of interaction.

“The actions and decisions of organisations and individuals (both regulators and regulatees) are thus structured by the norms regulating their conduct, by the senses of appropriateness of action, of understanding of how the environment operates, and by the distribution of resources between themselves and others with whom they interact.”

However, May (2005, 317) suggests that the reasons for compliance are not yet fully clear even though a variety of researchers shifted the explanatory focus from enforcement measures to motives for compliance. He differentiated four main context factors which influence the degree of compliance (May 2005, 321 et seq.):

1. Enforcement practices or deterrent measures which are closely connected to the intensity of controls by administrative bodies.
2. Attitudes and beliefs which support the legitimacy and acceptance of a regulation.
3. Social and peer influence: Mainly the degree to which significant others are perceived or expected to comply with the regulation themselves.
4. The capacity to act: It has to be possible to act according to the law. Unrealistic duties are very likely to be ignored by firms or actors in general.

Despite this range of context factors, responsive regulation is organised around the interaction of two key parties: a regulated individual or collective actor and an enforcement agency. The targeted behaviour, its consequences or relevant documentation must be visible and available to a monitoring body (for case studies see: Lehmann-Nielsen/Parker 2009; May 2005, Ramsay 2006).

In the field of consumer protection these prerequisites are not always fulfilled. We have to distinguish at least two different approaches to consumer protection:

1. Regulation that targets the design or the production process of consumer products. Examples are safety requirements for technical devices or a ban on the use of specific harmful chemicals in certain consumer products.
2. Labelling schemes or product information standards are primarily instruments to support consumer choice, but they can also support consumer safety where a product is inherently safe provided that it is used in a responsible way. For some products, safe use requires a measure of precaution, for instance to open a window when applying a paint remover indoors. Such behaviour in private spaces is in general not observable by the regulatory agency. While in many countries the professional and registered craftsman is supervised by an occupational safety and health inspectorate, the private do-it-yourself-artisan has sole responsibility. Potential hazards to individual health or the environment result from individual behaviour of the private person. Safety requirements printed on the packaging or labels which indicate

poisonous or carcinogenic characteristics of product ingredients are meant to direct the behaviour of the consumer. To be effective those requirements have to be known in advance or the information has to be read and understood before applying the product.

This report focuses on the second type of consumer protection. Consumer information, however, is primarily justified by consumer choice consideration, for example: "The EU officially recognizes that approved GM foods are as safe as conventional foods, and mandatory labelling is justified solely by the desire to provide informed consumer choice" (Carter and Gruère 2003, 68).⁶ The rationale is to strengthen informed consumer choice through mandatory product information in line with predefined product categories. While the consumer choice rationale has been developed in the context of the GMO debate, the doctrine is currently transposed to nanomaterials or chemicals more generally: "Consumers need access to information on chemicals to enable them to make informed decisions about substances that they use [...]" (European Commission 2001b, 7). The Commission White Paper Strategy for a future Chemicals Policy concludes that:

"EU citizens should have access to information about chemicals to which they are exposed. Information must be presented in such a way that it enables a person to understand the risks and to develop a sense of proportion in order to make a judgement on the acceptability of those risks." (European Commission 2001b, 26)

While this approach gives more degrees of freedom to the consumer it also transfers the responsibility for careful and appropriate application or use to the consumer⁷. The purchase of a product at the point of sale and the mode of application at the point of use are driven by individual motivations and shaped by the knowledge and the risk assessment of the individual consumer – who has often limited awareness and knowledge of or interest in the product ingredients and their characteristics.

Implementation of labelling regulations has two aspects targeting different actors: First, the producer has to provide necessary information, normally based on mandatory documentation requirements. Documentation and rele-

⁶ Developing their argument they reverse the notion of informed choice in a different way that a increase of information reduces the opportunities of choice because of mandatory labelling requirements. The choice options are realistically given on the side of the producer and retailer while incentives to bring GMO products to the market are low. To use GMO ingredients will probably lead to a first mover disadvantage due to a loss of market share as well as political pressure and negative publicity (Carter Gruère 2003, 70; see also Gruère Rao 2007, 55)

⁷ Here comes a very general question into play: Which is the better approach choice editing or informed choice?

vant information are submitted to or checked by a monitoring body, which can be a public or private entity; private monitoring bodies are normally regulated and monitored by some public agency. The actions of the monitoring body in connection with possible sanctions should motivate the producer to provide the required information. Compliance will be influenced by enforcement practices, intensity of controls, severity of potential punishment, attitudes and beliefs, social and peer influence and the capacity to act (May 2005, see above). Secondly, the actual users of the product and their behaviour are the main target. Users can be professionally skilled (and more or less tightly monitored under health and safety regulations) or lay persons using a – potentially hazardous – product for the first time, occasionally or regularly. For private users, the four context factors identified by May (2005) for professional entities typically take a different shape:

- Punishment for malpractice is very unlikely because the use of approved products by private consumers is normally neither monitored nor controlled. No threat of sanctions will therefore influence behaviour.
- The legitimacy of safety requirements is usually not questioned but they might still be ignored. Attitudes towards health and safety differ by gender and age. Such attitudes can only be indirectly influenced through educational campaigns.
- Social and peer influences can work either to support or to undermine health and safety information.
- The capacity to act depends on a range of personal and situational circumstances which can get in the way of protective measures: The weather is too cold to open the window while using a paint remover, necessary tools or devices are not at hand etc.

Consumer protection, that is the prevention of malpractice during use of potentially harmful products, via product information has to take into account that: [1] Addressees are mainly doing harm to themselves by neglecting the safety requirements. [2] Controlling influences act on a private level and in unsystematic and unreliable ways (e.g., the spouse asking whether it would be worth to think about some protective measures). [3] Potential harm is likely to be discounted (“Won’t happen to me!”), therefore, reasonable safety measures are neglected. [4] The activity which generates the hazard has positive connotations which are often reinforced by the social environment (e.g. cleaning or refurbishing). [5] Preventive or countermeasures are often seen as cumbersome in relation to their potential benefits. These five aspects – particular where they accumulate – often cause consumer reluctance to read product information and act accordingly. Nevertheless, a safety concept that rests on self-responsibility is dependent on the willingness and ability of the individual to act according to the health and safety guidelines.

However, product safety and product labelling schemes primarily regulate the producers of the products who are obliged to give sufficient product information which is for instances suitable to reduce potential health or environmental hazards. Further information might be related to ingredients which could also be important for informed consumer choice. Information printed on the packaging of a product is just a first step which is intended to activate a second and more important step by consumers. It is their choice which has to be informed and it is the individual product application which turns a potential risk related to a product or its ingredients into an actual hazard. The effectiveness of this two-stage sequence depends on the consumer reading and understanding the relevant information.

Apart from the regulatory challenges, the politics of product information and labelling is characterized by a very specific set of influences on law-making and implementation:

- The introduction of mandatory product labelling schemes is often controversial where producers or retailers are concerned about a stigmatization effect.
- The immediate targets of labelling and information requirements (producers or retailer) are often well organized and exert political influence.
- The indirect targets (consumers) are much less organized and represented by NGOs with few resources, often struggling to participate in extended consultations or regulatory negotiation.
- The regulator lacks control over consumer behaviour in the handling of the product, which can normally not be monitored. Such monitoring, however, is not necessary where consumers understand that following behavioural guidelines is in their own best interest.

In other words: The information interests or demands of consumers – who would benefit from proper understanding of product characteristics and behavioural guidelines - are often weaker organised than the interests of information holders, for whom information and labelling requirements generate costs (but who have an interest in avoiding visible harm linked to their product). This imbalance is exacerbated by the lack of knowledge about consumer uptake and understanding of available product information.

As a result, there is a need 1) to strengthen the understanding of the information needs of consumers, for the purpose of both consumer choice and responsible handling by consumers of products with potential health and safety implications; and 2) to systematically link evidence about consumer information needs into regulatory impact assessment. These needs are even more important with regard to novel products where consumers can rely less on their own experience and where the health and environmental implications

are more uncertain than with long-established products.

With a view to establish a systematic reflection on the implications of alternative regulatory approaches on target behaviour, the following section introduces a model of political intervention which is rooted in the approach of the Homo Oeconomicus Institutionalism developed by the sofia research group (see: Führ/Feindt/Bizer 2007, Steffensen/Below/Merenyi 2009).

2.4

Better Regulation and behavioural models

This section explains the behavioural model underlying the approach to Better Regulation in the SEBEROC project. We differentiate the Homo Oeconomicus Institutionalism against more simple but less suitable models of regulatory behaviour and explain the need for context specific empirical evidence on the norms and beliefs held by addressees of regulation.

2.4.1

Towards a behavioural model for Better Regulation

A basic and generic idea about regulation that is popular but somewhat naïve is presented in Figure 2 below:

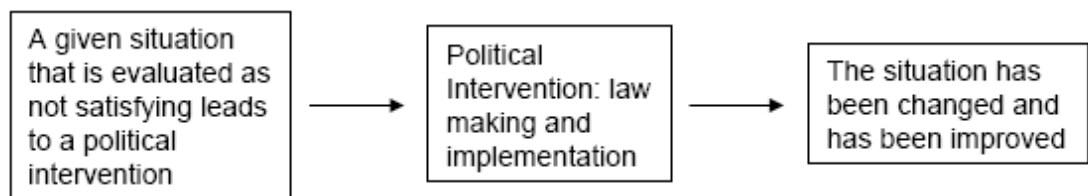


Figure 2: A simplistic model of political intervention (Source: SEBERROC team).

The simplistic regulatory imagination assumes that a new or revised regulatory intervention has a significant direct effect on the regulated entities who in response modify their behavioural patterns in a way that generates the intended changes. Such a simple intervention might work if the cause of the problem is relatively simple and clear, where the regulatory intervention can influence the motivation of the relevant actors in significant ways and where the implementing agencies command sufficient resources and pursue a consistent and effective implementation strategy.

However, 'real world' actors might develop creative alternatives to cope with the obligations defined in the regulation or might deliberately ignore or simply overlook the requirements of a regulation. It is therefore not always clear

whether the responses to regulation help to reduce the differences between the actual and the target state.

It is therefore necessary to reflect carefully on the links between the regulatory intervention and the intended or probable behavioural changes. Figure 3 outlines this more complex model of political intervention:

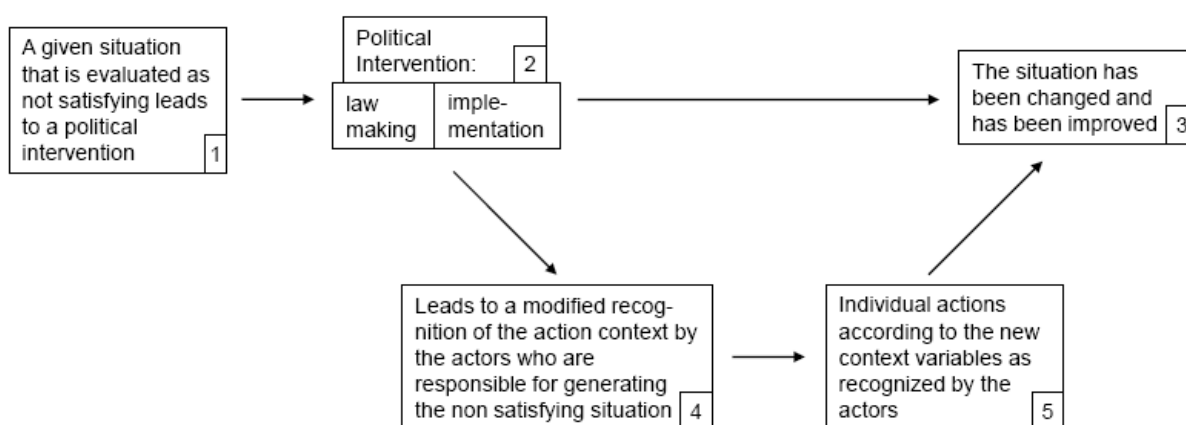


Figure 3: A model of regulation as macro-micro-macro interaction (Source: SEBERROC team).

Compared with the previous diagram, Figure 3 includes a fundamental insight from James S. Coleman's work "Foundations of Social Theory" (1990). Boxes 2-5 in Figure 3 have been adopted from Coleman's "macro-micro-macro scheme" which explains social macro-situations by focussing on the micro-behaviour of individuals which in turn is shaped by macro-phenomena (Esser 1993, see also: 1999, 17). Coleman starts from the premise that all situations and developments on the macro-level of a society are the (cumulative) result of a multitude of individual decisions and consecutive actions on the micro-level. The accumulation of individual activities described at the lower level of the diagram leads to the structural phenomena on the macro-level. Collective phenomena like the overall level of environmental pollution in a region are the result of individual reasoning and decisions leading to a more or less environmental friendly behaviour by individuals, families, firms etc.

With regard to regulatory interventions, the actual as well as the target state at the macro level emerge from a number of individual activities, which in turn are shaped, although not fully determined by macro-level structures. Successful regulatory interventions therefore need to be based on a sound understanding of the rationale of the target actors in order to influence them effectively.

Assumptions about motives shape what behavioural responses to suggested regulation are expected. In discussions about product information, for exam-

ple, there is a popular assumption that consumers are generally not interested in reading on-package. Especially representatives of firms argue therefore that mandatory product information does not lead to significant effects and is therefore costly but ineffective. In contrast, Steffensen and Below (2009) paint a more differentiated picture. Based on focus groups, they found a significant subgroup of consumers who are strongly interested in information about chemical substances used in products. These consumers nevertheless report that they rarely search actively for information because of obstacles they had experienced when previously trying to find suitable product information. The use of product information is for this group mainly a question of easy access and availability. Regulation for improving informed choice should take this group of consumers into consideration as a relevant group that might also influence others and hence help to extend the number of consumers using the information provided.

Box 4 of Figure 3 represents the reasoning of the actor(s) in a given situation that leads to the selection of one of the alternative paths of action or behaviour (e.g., buying a specific product, investing in a specific technology, developing innovations, hiring an unemployed person etc. or omitting all options considered). Whether the individual reasoning is subconscious or deliberate, box 4 can be seen as a representation of the strategic calculations of actors, of the information gathered and considered, as well as the individual preferences. An important influence are also the anticipated reactions of significant others who might approve the chosen alternative or not. The connection between the process of reasoning and the action (represented by box 5) can be modelled theoretically by various theories (e.g. game theory, decision theory or symbolic interaction theory). It is here that the SEBEROC project deploys the homo oeconomicus institutionalis framework which will be discussed in the next section.

In the Responsive Regulation literature (see chapter 2.3) the reasoning located in box 4 of Figure 3 was discussed as willingness or a reluctance to comply influenced by perceived legitimacy of the regulation, peer behaviour, severity of penalties and the probability and intensity of controls (May 2005, 317). The suggestion of the SEBEROC-project is that a closer look to the individual motives and strategies of the regulated actors is necessary to conceptualize effective regulations.

Figure 4 adds two features to the diagram which are key elements of the Responsive Regulation or Good Governance debate: the consultation process during law-making and the enforcement by a supervising administration. It highlights a communicative circle between regulators, administration, and target groups or their representatives. Communication will be more intensive when members of the target group are in contact with their representative industry associations or other non-governmental organisations or with the local authorities which implement regulations on the other. While the link from

box 4 to box 2, via representatives/stakeholders is described through consultation procedures, the path from box 2 via public administration to box 4 is the focus of responsive regulation discussed in section 2.3 (e.g. Braithwaite 2002; May 2005, Baldwin and Black 2009). However, responsive regulation needs feedback loops, with consultation complementing observation of behaviour by the implementing agency.

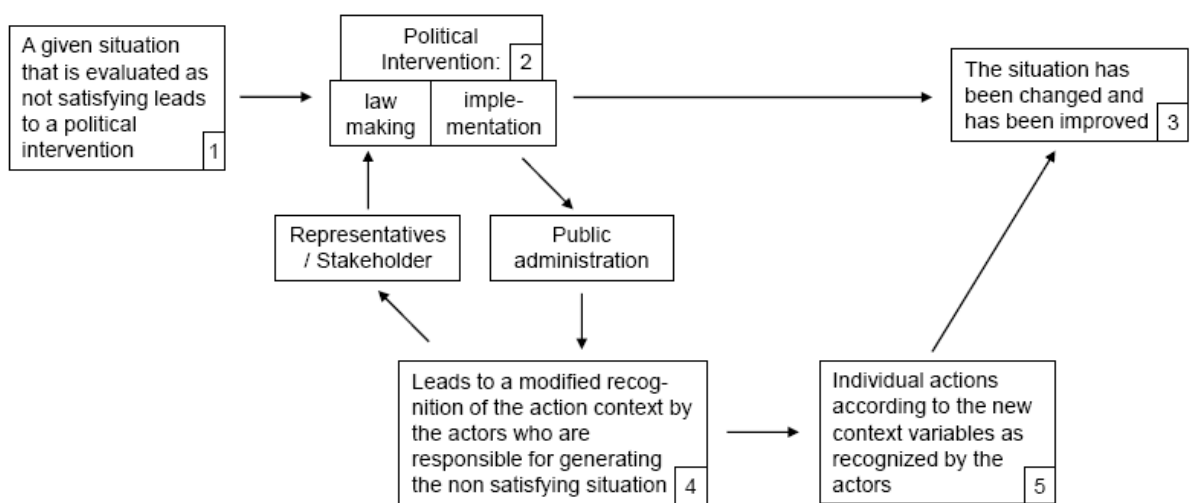


Figure 4: A model of regulatory intervention including implementation and consultation (Source: SEBERROC team).

Where the regulatory intervention aims at changing of established routines of behaviour or decision-making, the targeted group of actors, will normally face costs and efforts which they would like to avoid. Enforcement by public authorities might be necessary, in particular when the regulated actors disagree with the regulatory aims or feel that the effort required from them is comparatively high compared to its contribution to the public policy aim. For example, most people have a positive attitude towards environmental protection but resist individual contributions. However, choice can be influenced not only the calculus of egoistic individual utility-maximization, but also by norms, perceptions, and limited skills, time and resources, as we will discuss in the next section.

Responsive regulation in the area of consumer information requires good knowledge about consumer needs, values, motives, strategies and attitudes. Effective regulation depends on correct answers to the questions “Which information is important for the consumer?”, “Which information is necessary but not readily available?” and “How can producers and retailers be influenced to provide the lacking information effectively?” According to the Better Regulation approach this knowledge will be incorporated through scientific

evidence and the consultation process. The basic idea of the SEBEROC-Project is to broaden the knowledge base and thus strengthen the position of the consumer in the consultation process by an empirical research approach (see Figure 5: The SEBEROC-approach to Better Regulation).

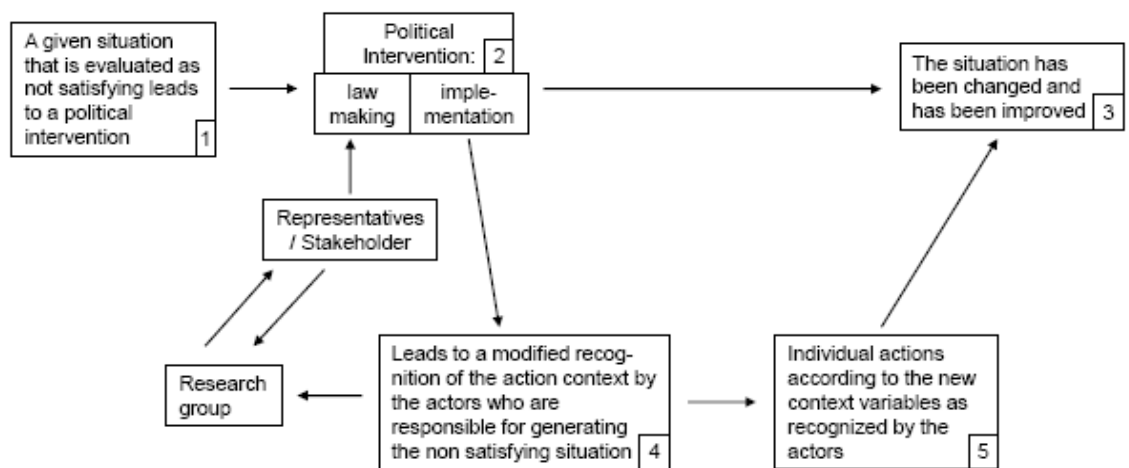


Figure 5: The SEBEROC-approach to Better Regulation (Source: SEBEROC team).

2.5

Reflecting behavioural assumptions: The homo oeconomicus institutionalis (hoi) framework

The critical link in the responsive regulation model are the assumptions about the factors which influence choice at the individual level.

Bizer, Feindt and Führ (2006) argue that regulatory impact assessment requires a conceptual framework that allows for both the formulation of reasonable expectations and the inclusion of relevant contextual factors that systematically influence responses to regulation. The homo oeconomicus institutionalis framework (Bizer, Feindt and Führ 2006) offers a systematic elaboration of the lower level of Figure 4 which represents the process of individual choice-making. The framework acknowledges the rational choice position that positive and/or negative incentives are significant aspects of a regulation. However, when behavioural patterns are entrenched in routines, incentives need to be very strong or regulatory intervention need to disrupt routines behaviour, which might raise questions of proportionality. Only if routines or strategies which were successful in the past become problematic to the individual, or if attractive alternatives gain attention, will people start scrutinizing established forms of behavior and, adopt new routines or strategy.

Much regulation is based on a model of behavior that is rooted in a relatively simple version of rational choice, namely the model of Rational Egoistic Evaluating Man (REMM). REMM is an opportunistic utility maximiser who evaluates the costs and benefits of all available options with unlimited cognitive capacity – that is, he has all relevant information and he is indifferent to the effects on others. The REMM model has been widely challenged and often modified. For example, does REMM only look for local and short term utility or is a more strategic attitude possible that maximises utility more globally (implying strategies which include short term losses to allow for higher long term gains, see e.g. Elster 1987).

The homo oeconomicus institutionalis framework (Bizer Feindt Führ 2007, see also Bizer Führ 2007, Steffensen Below 2009) takes a broader view. The general approach is diagrammed in Figure 6: The oeconomicus institutionalis framework below.

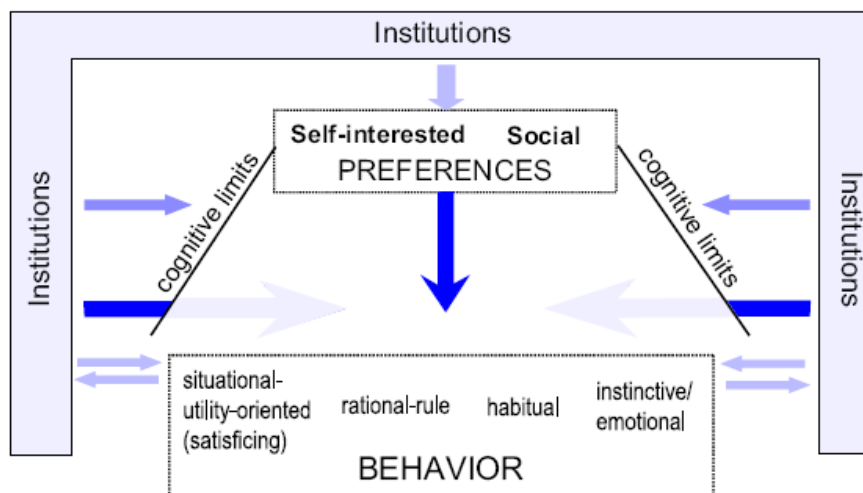


Figure 6: The oeconomicus institutionalis framework (Source: Führ Bizer Feindt 2007, 23).

Figure 6: The oeconomicus institutionalis framework can be read as a more detailed account of boxes 4 and 5 in Figure 4. The scheme is applicable for the analysis of individual actors (a single consumer) as well as corporate actors (e.g. firms, administrations etc.). At the heart of the figure the actor and her or his behaviour is shown as guided by self-interested preferences which, however, can be complemented by social preferences, for example fairness. Both self-interested and social preferences are influenced by institutions (rules, norms, expectations etc.). Two inclined lines symbolize cognitive limits which can be understood in accordance with the concept of "limited rationality" author's like (e.g. Simon 1993; first 1958, March 1994). Cognitive limits imply

that actors are not necessarily capable to take all important information into consideration. Hence, responsive regulation needs to consider which knowledge is available and understandable for the target actors.

If decisions are made on the basis of restricted knowledge, regulations can be conceived as providing a set of reasons guiding the pre-selection of alternatives and narrowing the variety of options. For example, labelling schemes structure consumer choice by highlighting certain product characteristics (environmental friendliness, fair pay, a low amount of CO₂ etc.) in order to motivate consumers to consider these additional information as a relevant part of their product choice. To use a label instead of a variety of detailed information (e.g., CO₂-emissions from production, transportation, retailing, use and disposal as product carbon footprint) reduces great complexity to simple pieces of information. Another question is whether consumers can attach meaning to such condensed information.

Coming back to Figure 7 the interests of the actors combined with a subset of institutions trigger and influence the selection of a certain alternative – in our case studies the purchase of a product due to the (non)-existence of a label. In general four types of typical behavioural patterns (Führ/Feindt/Bizer 2007) can be found which are shown in the lower box of Figure 7. There the four types of behaviour comprise a general taxonomy which is similar to an established taxonomy of consumer decision-making styles when purchasing (see Foscht/Swoboda 2007, 151ff; Andersone/Gaile-Sarkane 2009, 347). In the following we use the wording chosen by Führ, Feindt and Bizer:

1. Situational utility oriented: Consumers decide based on their balancing of costs and benefits – much in line with the REMM model.
2. Rational-rule based behaviour saves decision-making costs by relying on established patterns and guiding rules. Often loyalty to a product brand or reliance on labels can offer such a guideline. Another example would be buying the best ranked product concerning energy efficiency or CO₂-emissions. In these cases the general guidelines are fixed but they still are consciously applied in the decision-making process and the consumer seeks for pre-selected information and considers them.
3. Habitual decisions are made as they always have been made, neglecting further information or newly available alternatives. Shopping routines are often habitual with consumer buying the same products week after week.
4. Instinctive and emotional purchases are made spontaneously without much consideration of costs and benefits, rule or habits. The unplanned purchase of sweets and toys offered near the check-out desk are typical examples which often address the emotional reactions of kids or even adults. Similar patterns apply to the purchase of

products with price reduction which are mainly bought because they are perceived to be cheap and without further consideration (as for calculated utility maximising behaviour). Instinctive and emotional purchases are often associated with post-decisional regret.

In marketing research the first type is named extended decision making applied by consumers mainly when the decision is connected with the recognition of risk or the expectation of a possible post-decisional regret. Type two is named limited decision making which is already quite close to habitual types but it still requires a certain amount of information search. Anderson and Gaile-Sarkane (2009: 347) combine the type 3 and 4 named as routine and impulsive decision making under the headline of habitual decision making. Furthermore, they assume that the last type of habitual decision making can usually be found when basic needs or everyday products are considered. Taking this into account it is understandable that consumers rarely really read product labels while selecting products in a supermarket (Steffensen/Below 2009).

Therefore, these four typical modes of purchasing behaviour describe different starting points for political means to enable an informed choice enhancing the capability of consumers to act rationally on the market place. Requirements to display on-package information or to label products in certain ways are endeavours to move decision making at the point of sale from mode 4 towards mode 1 or 2. I.e. product information though not considered deeply by the consumer until now are politically upgraded and given more importance in order to motivate consumers to make product choices more cognizant.

To facilitate a better success of political intervention the sofia approach proposes a detailed analysis of the behavioural patterns of the addressee of a regulation. Without an understanding of the motives and rationale of the actors who are obliged to change their behaviour a reasonable formulation of the relevant clauses will fail. The SEBEROC-project sets the premises that such an understanding of the motives of actors can be accomplished by consultation processes and the talks and negotiations included. Success of regulations is in most cases dependent on a correct detection of motives leading to the identification of incentives which might initiate desired modes of behaviour. We discussed this topic with reference to the Figures 2 to 6. To compensate the lack of powerful stakeholders in the field of consumer protection politics the SEBEROC-project suggested an approach instructed by a social science research methodology.

2.6

Conclusions for Better Regulation in SEBEROC

The SEBEROC-project seeks to improve the regulatory quality with a view on environmental and social impacts that are difficult to quantify by means of a consultation-based approach to Better Regulation. This approach does not seek to make a cost-benefit assessment, but to introduce a consultation procedure for the purpose of assessing social and environmental impacts of product information regulation in two fields of emerging technologies: GMO and nano materials applied to everyday household-products. Here, a focus lies on the analysis of the relation between causes and effects: information given to consumers and the products' social and environmental impacts. The specific approach of deliberately using social science research focussing the consumer is supposed to bring opinions and positions which are not represented adequately so far into the political process.

From the European Better Regulation approach and the underlying Good Governance principles (Openness, Participation, Accountability, Effectiveness, Coherence) the following criteria need to be taken into account when designing a process of consultation:

- Consultation is mandatory and should also raise public awareness due to a publicly visible process of participation that symbolizes the importance given to the consumer on the European political agenda.
- The consultation process needs to be open and such a process needs to be easily understandable for third parties to promote transparency and legitimacy of the decision.
- The participation of third parties needs to cover a broad variety of stakeholder views with a special consideration of minority groups, for example small and medium enterprises, certain NGOs and also citizens' views. Especially citizens or – in our case – consumers are not well organized due to a lack of resources. Furthermore, national differences with regard to culture need to be considered where appropriate to come to a real European regulation.
- A wide range of expertise from different disciplines should be collected. The SEBEROC approach allows to incorporate knowledge and behavioural attitudes of consumers into the negotiation process. This is especially crucial when politics is striving towards a betterment of the rights of consumers. A right to know and the possibility to perform an informed choice are resting on a consumer's willingness to [a] execute an informed choice and [b] to tackle the daily consumption with a thirst for knowledge.

- The role of evidence in public-decision making is increasing. When collecting the views of stakeholders it needs to be carefully considered whether these inputs are evidences or opinions.
- A variety of consultation tools should be applied. When carrying out direct consumer consultation different tools are appropriate, for example focus groups and Eurobarometer surveys.

We suggest a specific approach to handle political decision processes heading for a change of consumers' behavior. To change the behavior of addressees of a regulation requires a fundamental knowledge and consideration of her or his motives, strategies, targets and willingness. Otherwise regulations tend to miss their objectives because the necessary contributions of the regulatees provided. In the following chapter we outline the procedure carried out in the SEBEROC project.

3 **Methods of the SEBEROC approach**

The aim of the SEBEROC-project is to develop and to experimentally test a novel approach to Better Regulation. The special focus is on regulatory processes which target the general public in our two case studies in their role as consumer. The regulatory field is characterized by strong stakeholder groups representing the interests of producers and retailers of consumer products while the representatives of consumers or of environmental interests are relatively weak, in particular due to a lack of financial resources. Therefore the personnel of this second group of stakeholders has not got the possibility to participate in all negotiations concerning EU or national consumer protection policies. Some countries provide compensation for time spent on formal regulatory consultation to enable non-governmental organizations to participate.

In chapter 2 we stressed another difference between the two groups of stakeholders: The link between the individual producers and retailers on the one hand and their representing pressure groups is relatively close because the first are often members of the industry association which are actively lobbying bills and regulations. In contrast, the link between consumer representatives and consumers is loose and much less organised. This premise leads to the central research question of the SEBEROC project: How is it possible to strengthen the representation of opinions and beliefs of consumers in the political negotiation processes? Rather than focusing on resource endowment, the SEBEROC project looked for a modus of giving more weight to aspects of consumer behaviour and their procedures of information seeking by strengthening the evidence base in a systematic manner.

The approaches of Better Regulation and Good Governance on the one hand and the analytical framework of homo oeconomicus institutionalis on the other emphasize the behavioural patterns and responses of the regulated as important factor for regulatory success. If regulation – like in our case studies – is meant to enable informed consumer choice and therefore initiates or mandates labelling schemes or specific product information, the regulatory choice should consider consumer's willingness to read and to use such labels and information at the point of sale. To improve regulatory outcomes, robust knowledge about [1] consumers' attitudes towards seeking and processing information as well as [2] their acceptance of labels is necessary.

Such an approach is provided by the SEBEROC-project with its two case studies which exemplify a systematic and robust regulatory impact assessment as a means to facilitate Better Regulation. The SEBEROC research project has been conceptualized independent from real regulatory processes. Insofar it follows a purely experimental design. This implies certain limitations and possible pitfalls which we will discuss in later sections. The SKEP call combined the topics

Better Regulation and Converging Technologies which on the technology side were linked to nano-materials and genetically modified organisms (GMO). These two technologies were chosen even though a recognizable trend towards convergence is not observable at the moment. Until now only consumer products containing either nano-materials or GMOs are on the market, an integrative combination of both technologies might occur in future. The aspect of converging technologies was only touched by looking independently at two technologies which are seen as key-technologies for the further development, influencing our daily life and being candidates for convergence in the future.

Both technologies are in the early stages of their overall development. Public debate about their pros and cons is mainly concerned with the uncertainty about long-term human health and environmental impacts. Potential effects become especially pervasive when and where consumers come into direct contact with such novel products. While staff and employees handling new technologies and substances can be expected to have considerable knowledge about the products due to training and awareness raising this is quite different when it comes to consumers. The project focused on consumer products derived from GM and nano technologies to allow for a cross-technology comparison.

Nanotechnology: Research on nanotechnology has been carried out for twenty years now. It has shown great potential for innovations and improvements in various applications, including environmental, medical and information technologies. A variety of reports estimated a massive growth of markets for products in the nano-sector, inspiring the expectation that nanotechnology will be a major driver of economic development in the 21st century. Besides these clear opportunities, very little is known about the risks of many nano-materials⁸:

- Even for well-known materials which are non-hazardous on a macro scale we have to consider that the new technological opportunities which can be realized on the nano level are possibly connected with negative environmental and/or health effects⁹.
- The knowledge gap becomes even bigger when taking into account that the progressive down-sizing of nanoparticles can lead to several

⁸ Andrew P. Maynard (2006): *Nanotechnology: A Research Strategy for Addressing Risk* Woodrow Wilson International Center for Scholars. Project on Emerging Nanotechnologies. Washington, D.C. The Royal Academy of Engineering (2004): *Nanoscience and Nanotechnologies: Opportunities and Uncertainties*. London.

⁹ Günter Oberdörster, Eva Oberdörster, Jan Oberdörster (2005): *Nanotoxicology: An Emerging Discipline Evolving from Studies of ultrafine Particles*. In: *Environmental Health Perspectives*, vol. 113, no. 7, pp.823-839.

stages of different material characteristics. These multiple stages may offer technical and economic opportunities as well as changing hazards for the environment and human health. Until now no severe health or environmental hazards in connection with everyday products have become known. Nonetheless it is generally expected that nano-substances change not only those characteristics which are relevant for production processes or their specific applicability when being downsized.

- Particularly unknown are impacts arising from the long-term use of products that contain nano-materials or from new applications in the field of, e.g., modern medical treatments of brain diseases and injuries.

In general a trend can be observed which leads to an increased number of nano products on the market for consumer products, even though many companies evaluate the term nano as partly ambiguous. On the one hand nano symbolizes the modernity and cleanliness of products, on the other hand the term stands for uncertain risks not yet completely discovered or understood.

Biotechnology: The public discussion of the effects of biotechnology is older and more visible. The fields of application are broad and known as white (micro-organisms), grey (animals), green (plants), and red (human, medicine) biotechnology. Similar to nanotechnology a broad array of multifaceted applications is envisaged with several options already realized. Nevertheless experts and laypersons often come to different results when discussing the pros and cons of the technological opportunities¹⁰. While the opportunities are clear-cut, many risks have not yet been fully assessed:

- Research results¹¹ indicate that modern biotechnology is not connected with specific risks which are fundamentally more hazardous than the effects of conventional biotechnology like plant breeding or hybridation. Having said that, the acceleration of the innovation processes including product diffusion on a worldwide market implies the possibility of cumulative effects of e.g. local outdoor tests.

¹⁰ Lucia Savadori, Stefania Savio, Eraldo Nicotra, Rimo Rimonati, Melissa Finucane, Paul Slovic (2005): Expert and Public Perception of Risk from Biotechnology. In: Risk Analysis, vol. 24, no. 5, pp. 1289-1299. George Gaskell, Sally Stares and others (2006): Europeans and Biotechnology in 2005: Patterns and Trends. Final report to Eurobarometer 64.3. London.

¹¹ W. van den Daele, A. Pühler, H. Sukopp, A. Bora, R. Döbert, S. Neubert, V. Siewert (1996): Grüne Gentechnik im Widerstreit : Modell einer partizipativen Technikfolgenabschätzung zum Einsatz transgener herbizidresistenter Pflanzen. Weinheim u.a.: VCH

- Among ethical and health considerations especially hazardous long-term effects are depicted as relevant knowledge gaps in the published risk evaluations.

With regard to both technologies we can summarize: research and development activities have discovered and generated opportunities and applications; but potential risks and uncertainties which could affect human health and/or the environment are not well understood. Furthermore, some possible negative health or environmental effects are potentially irreversible. Hence, the novelty of modern technologies per se acts as a powerful source of uncertainty that deserves particular attention from a human health and environmental protection perspective. This argumentation does not imply that these new technologies are per se hazardous but it highlights the necessity to permanently assess the development in order to avoid undesirable side effects. Eventual negative effects might have severe outcomes because of [1] long periods of latency and [2] transnational markets. Both aspects taken together have the potential to breed fatal effects.

While nano- and biotechnology are similar so far some significant differences are instructive for the concept of the SEBEROC project:

- Biotechnology has been discussed for nearly two decades in public with predominantly critical notions. Nanotechnology in contrast is currently evaluated as a modern, positive, and mainly enabling technology which offers a wide range of opportunities.
- Biotechnology has become subject to technology specific regulation on the EU level and in various EU member states, while nanotechnology has barely entered the focus of political action or even debate.

From a technology assessment perspective, the combination of similarities in risk profile and knowledge gaps on the one hand and differences in regulatory response, creation of risk management schemes and public perception on the other is at the very heart of the research design.

With respect to a regulatory impact assessment the two selected technologies chosen for the case studies offer the advantage of being in different stages of the political and societal discussion. While GMOs and bio-technology have been discussed intensively and critically for 15 to 20 years, nano is still a young technology which so far has not yet received the same attention and scrutiny from consumers and the wider public. A specific regulatory approach for nano-products and processed is not on its way; so far more general legislation covering chemicals applies.

3.1

Most similar case design selection of case studies

From the perspective of Better Regulation and regulatory impact assessment the two technologies offer special opportunities for comparison:

- With regard to nanotechnology we will simulate prospectively the regulation in one area of emerging application: the use of nano-silver which is one of the nano-materials used in a variety of consumer products.
- A specific regulatory area of genetic engineering which would be retrospective, e.g. the use of genetically modified organisms in feed and therefore with some relevance for food production. GMO-specific regulation has been established two decades ago; hence this case study is conceptualized as a retrospective regulatory impact assessment evaluating the on-going process in order to identify options for improvement.

Even though a variety of applications of both technologies can be found on the market it took long discussions within the project team to select these two examples for comparison. To avoid problems with data comparability it was necessary to use technology applications taken from the same field of consumers' experience and everyday life. This was important because research about the assessment of GMO regularly reveals that medical applications are perceived mostly positive while GMO in the food sector is predominantly seen more negative. To identify comparable differences the project team chose for both fields applications in the field of food or food-related products.

- GMO-soy was selected as the focal product for biotechnology and especially for the focus group with consumers. GMO-soy is widely used as feed for cattle in Europe and world-wide. Even though no difference can be traced between cattle raised with normal soy and GMO soy the public perception will probably not be that informed. One can expect a large share of critical, informed consumers who will be eager to stay informed via a GMO-free label or something comparable.
- Nano-materials are still seen as positive, modern and clean. Till now these substances are not framed in a way chemical ingredients are evaluated normally. Chemicals are for many consumers connected with a conception of being carcinogen, poisonous and hazardous. Consumers often argue spontaneously with a dichotomy of natural purity and artificiality.

In the field of food packaging and handling, nano-silver is a material increasingly used due to its antibacterial. To stimulate the group discussion with consumers the project team decided to use a chopping board coated with nano-silver as the focal product.

3.2 The institutional framework

European policies intended to deal with health and environmental aspects of GMO and nanotechnology have to consider two aspects: First the necessity to set up a consistent and standardised regulatory framework and, second, to set up a European framework which leaves sufficient policy space for national specifics. Differences in the national framework conditions are a long-term outcome of: previously existing national laws and regulations; specific political or social traditions of dealing with GMO or nanotechnology; scandals or intense political discussions within the national context; country-specific attitudes and dominant discourses – e.g. a hegemonic discourse to avoid GMO products in agriculture (Austria); or the presence or absence of a significant domestic industry for nano-materials or GMO feed and food.

One of the project aims is to include such national differences between the participating five countries in the participatory regulatory assessment. It is necessary to keep such differences in mind, to understand and adequately analyse the outcomes of the interviews with representatives from national stakeholders. These representatives partly mirror the existing national situation in their attitudes and positions, which are the (institutionalized) results of the previous discussions and political negotiations with the public or with political pressure groups. This is also relevant when analysing and understanding the different attitudes of the public in their roles as consumers or citizens. Generally, the publics in different countries are seen as more sceptical towards new technologies, or as more ecologically minded or as less interested about either technology or ecology. These national specifics constitute a frame of reference for political negotiations allowing for different degrees of freedom within the political arena.

Therefore, this study offers five national perspectives towards GMO and nano-materials. Each country specific describes the national situation by focussing on the national regulatory framework. By beginning with the national regulatory situation, the situation of national practices will be put into a European context which also serves to give reasons for national differences. Moreover, besides the regulatory means with the status of laws, there might also be voluntary agreements, this instrument is in use in different countries (e.g. in Switzerland: IG DHS Code of Conduct on Nanotechnology).

- Which laws and regulations do apply for genetic engineering?
- Which of these regulations are relevant for consumer products?
- Which of these regulations consist of clauses that require for a specific consumer behaviour in order? The aim of these regulations should be consumer protection and environmental safety.
- Are special aspects of importance that occur on a national level?

- Are there important national regulations to concretise EU-regulation?

The national case studies also comprise of a short analysis of the market situation and of the national debates to put regulatory developments and outcomes into the specific national context.

3.3

Telephone Interviews with national stakeholders

The national interviews with stakeholders were carried out to probe the situation and acquire insights with regard to the regulatory approach at the European and the national level, as well as their perception of the role of consumer information. This step formed a part of the participation process tested by the SEBEROC-consortium. The interviews served two purposes:

1. to retrieve the stakeholders' perspective on their role in the consultation processes set up by law.
2. to assess the specific role of the consumers'/citizens' behaviour and/or perception of GMO- or nano-products. Here the focus was on labelling requirements or possibilities and their perceived impact on consumers'/citizens' behaviour or perception of these products.

The interview helped to get an overview of specific national problems related to these issues. On the one hand the specific views of the national stakeholders relating to the information channels in the GMO- and nano-legislations were collected, on the other hand, the problems relating to these processes were also part of the interviews.

The interviews were conducted after a pre-test had allowed to rectify unclear and ambivalent wording.

Potential interviewees were contacted and provided with the project summary. The telephone interviews were semi-structured, based on an agreed and binding interview guideline (see Appendix) which was translated from German and English into the different languages. The interview contained both open questions and several scales. The sequence of questions was carefully designed to avoid context effects.

The findings from the interviews are presented in the country cases studies (see chapter 5) and summarized in the national comparison chapter (see chapter 6).

3.4

First Workshop with European stakeholders

The first workshop with European stakeholders evaluated the findings of the previous working steps (regulatory framework, country specifics and findings

from the interviews with national stakeholders). Moreover, the workshop served to discuss regulatory issues from the point of view of European stakeholders. The findings from the EU stakeholder workshop informed the guidelines for the following empirical step: the focus groups with consumers. More information on the workshops can be found in chapter 8.1.

3.5

Focus groups with consumers – comparative approach

Focus groups in the European partner-countries were carried out to acquire the views of consumers. In each country, the approach aimed at conducting three focus groups on each of the two technologies with a random sample of participants. Beforehand, the approach was discussed in the workshop with European stakeholder representatives to clarify the empirical information that is deemed necessary in the selected fields of NT and GE.

The main themes for the focus groups were:

1. Consumers' state of knowledge with regard to GE or NT, e.g., what do consumers know about these two technologies, how do they frame them?
2. Individual risk assessment concerning GE and NT, e.g., how do consumers inform themselves about NT and GE? Why do they use specific information channels? Which sources of information do consumers trust? What do they expect?
3. Consumer behaviour, e.g., how do consumers handle products containing NT or GMOs throughout the product lifecycle (from purchase to disposal)?

The composition and the findings are presented in the country case studies (see chapter 5) and compared in chapter 6.

3.5.1

Overall research questions

The overall questions for the focus groups were:

- How do consumers perceive and assess human health and environmental impacts from new technologies?
- How do consumers respond to technology related information?
- How do consumers respond to information in different media (on package, online)?
- Are there national differences (A; D; NL, SF, UK) or differences across technologies that need to be taken into account?
- How can CSOs participate more effectively when regulating CTs?

- How do CSOs view the role of consumers?

3.5.2

Theme 1: Consumer's perception of risks and benefits

First, consumers' perceptions of risks and benefits were discussed. In this first theme the following research questions informed the approach:

- Risks and benefits: Which are perceived, if any, by consumers? Health, environment, economic; moral, social, ethical, ...
- Safety studies: Are consumers aware of them, and if so, do the studies help to build trust?
- Effective and balanced debate: Do consumers know about pros and cons? Have debates helped them to understand GM and nanotechnology?
- Moral aspects: Are they important to consumers?
- Benefits to the consumer: Which are perceived, if any, and how are they related to purchasing criteria?

3.5.3

Theme 2: The role of information

With regard to the role of information, the following research questions informed the approach:

- How do consumers receive information on GM and nano?
- How do they assess the trustworthiness of information?
- What kind of information is deemed more or less valuable?
- What kind of information can potentially influence purchasing decision, how and why?
- Is information perceived as neutral or as loaded?
- What information should be on the product or available through other sources?

3.5.4

Theme 3: Labelling and communication

Third, actual labelling and communication practices were tested against the background of the specifics of the technologies. The following research questions informed the approach:

How do labels and product information work against the background of ...

- a lack of public debate (nano) or a polarised public debate (GM)?
- uncertainties about impacts;
- conceptual ambiguity and potential accusations of being misleading to consumers (e.g.: what is “GM-free”?);
- transaction costs linked to labelling schemes (traceability, monitoring, communication, etc.);
- possible further implications, e.g. the need for separate product streams (coexistence).

3.5.5

Approach to the groups discussions

The focus groups consisted of 8 to 10 participants. A random sample of adult consumers was invited to a discussion about consumer products made with novel technologies. Since the need to respond to the invitation letter includes an element of self-selection of participants, the invitation letter was framed as neutral as possible. It mentioned the general project background but not the specific technology or product nor any specific issues or concerns

The focus group convenors did not provide substantial explanations about the technologies’ risks and benefits. The purpose was

- to gain insight into the participants’ knowledge about the technology in general;
- to understand how the participants make sense of the technology and its application in products and how their understanding is shaped by product and technology images and perceived risks and benefits.

Nevertheless, the facilitator introduced some basic information about the respective technology, if necessary, to satisfy information demands from participants.

Subsequently, a specific focal product was introduced: GM soy margarine or nano-silver chopping boards respectively. Both products are food or at least food related products and therefore to a certain extent comparable.

Participants were asked about advantages and disadvantages of the novel technology product compared to the traditional product and for their criteria for purchasing or not the new technology product.

Subsequently, three different forms of product information were discussed. The first input was a label attached to product. The GM focus groups were presented with a soy margarine that was declared “GM free” via a logo (see Figure 7: GMO free label used in the focus groups). The nano groups received a chopping board with a 10^{-9} logo attached to the product (or the transparent packaging (see Figure 8: nano label used in the focus groups)).



Figure 7: GMO free label used in the focus groups



Figure 8: nano label used in the focus groups

The second input was a more detailed piece of information on the product or packaging: “contains genetically modified soy”, “contains nano silver” respectively. The product information was placed near the ingredients lists (or its equivalent for the chopping board). The third input was a set of print-outs from a website which contained more information on the background of the technology. For the GMO case the product register from the GMO compass website was used.¹² The nano website was from BEUC’s register of products

¹² See <http://www.gmo-compass.org>.

with “nano claims” with an additional, product-specific excel file following the style of the BEUC register.¹³

Towards the end participants were asked to discuss responsibilities of the different actors for:

- risk reduction (safety) and
- appropriate consumer information.

Participants were also prompted for their views on the responsibility of consumers.

The focus groups guidelines can be found in Appendix II.

3.6

Second Workshop with EU Stakeholders

In a second and final workshop the findings of the project were discussed with EU stakeholders. Participants were asked for feedback on the project team’s interpretation of the data and for their evaluation of the findings with respect to participation for better regulation. Key questions included:

- How do consumers link information about products and technologies?
- What information are consumers looking for when they assess products made with novel technologies? Which national differences justify or demand national policy space in the single market?
- How do consumers look for and assess information (sources, media etc), and how do they make sense of the information they are confronted with?
- How does information contribute to consumer trust in the relevant products and technologies?
- What lessons can be learned for better regulation?
- Is there sufficient understanding of the consumer perspective?

Furthermore, workshop participants were asked to assess the overall approach of the research project:

- Does the project provide a suitable procedure to inform stakeholder groups or other political actors and will it offer informational support in the political processes?
- Does the approach add value to the regulatory process?
- How are the findings from the survey useful for political actors?
- How can the information be used?

¹³ See <http://www.beuc.org/Content/Default.asp?PageID=2142>.

- Is more or different information necessary?
- Further research needs?

The outcomes of the workshops are presented in chapter 8.2.

4

Regulatory framework in Europe

For the analysis of the consumers behaviour in both cases, nano and GMOs, it is necessary to have a clear concept of the institutions in mind which are surrounding the actor and therefore are contributing to the actual behaviour. Since consumers' informational behaviours lie at the heart of the SEBEROC research project, the related information provisions concerning labelling and consumer information available on the European market are a core element of the project. Nonetheless, the question whether a product is being labelled or not lies in the details of the laws, beginning with definitions which deem what as to be labelled and other questions relating to the authorisation of products before they get access to the European internal market. To reflect on current debates, for example in the GMO sector one must also take into account what is under which conditions being authorised and considered being safe. In those process more information are available to the public and its valuation by stakeholders are to a certain extent reflected by consumers and citizens.

Moreover, the drawing of sound conclusions on how to regulate consumer information in a meaningful way strongly depends not only on the provisions laid down in regulations and directives, but also on how those provisions are actually implemented on the European market, especially in the five considered countries. Moreover, market data needs to be analysed to have an idea how relevant those products are on the different national markets. Besides consumer information which directly relating to the products considered, an analysis of the media coverage is crucial to assess the degree of presence of the products in question in the minds of the consumers.

Therefore in a first step the regulatory framework concerning the product information in both considered cases is presented. In a second step the country specifics are described.

4.1

European Regulations on product information

The section on the European law framework on product information provides synoptic information on the different provisions, which are, on the one hand, applicable to the products considered by the SEBEROC research project. These are, genetically modified soy beans (GM soy) in margarines and nano-silver used to add an antibacterial function to chopping boards. Here, the regulatory aims of the applicable laws will be reflected, as well as, definitions.

On the other hand, the legal framework also comprises of the authorisation procedures under the specific regulatory regime. Product information relies on the information which is provided during the authorisation processes and therefore the reliability of such information strongly depends on those proc-

esses and risk information acquired and evaluated during those processes. The subsequent risk management phase will then decide how to handle the product (e.g. market access or not, as well as, specific requirements for market entry). The focus of this chapter aims at the consumer's perspective who is the addressee of product information via labelling, provided directly on the product and also addressee of information about the risk assessment process.

While most of the GM soy available in Europe is imported and used as cattle feed,¹⁴ soybeans in general are also directly used in margarines. Although a direct application of GMOs as food is rarely the case they are mostly used as food additives (e.g. vegetable oil and lecithin).¹⁵ Although labelling is mandatory, there are important exceptions to take into consideration. However, in the different considered countries GM soy is present in margarines at least under a specific threshold. The result is that those products containing GM soy under the threshold do not have to be labelled containing GMOs. These exceptions will be considered in the GMO-chapter.

The possibilities and the practices to use nano-silver in products are resulting in a broad range of applications. Today, food-packaging, washing machines, refrigerators, toothpaste, diverse cosmetics, textiles, lacquer and paint and many more products claim to contain nano-silver (Bund 2009, 8 et seq., Chaudrhy et al 2008, BMG 2010). This chapter will summarize the recent regulatory developments aiming at the labelling of nanoparticles in products, especially nano-silver in chopping boards. Notably, most of these regulations will take effect in the future and currently there is no mandatory labelling system of consumer products in force.

To get a better understanding of underlying rules concerning both considered case studies which are directly concerning food, as well as, food-related a first introduction discusses general principles in European food regulation followed by general principles of European chemicals legislation.

On 28th January 2002 the European Parliament and the Council adopted Regulation (EC) 178/2002 laying down the General Principles and requirements of Food Law (Framework Regulation on Food). The aim of the General Food Law Regulation is to provide a framework to ensure a coherent approach in the development of food legislation. At the same time, it provides the general framework for those areas not covered by specific harmonised

¹⁴ European Commission, Directorate-General for Agricultural and Rural Development (2007): Economic Impact of Unapproved GMOs on EU Feed Imports and Livestock Production, Analysis, p. 5.

¹⁵ See <http://www.transgen.de/datenbank/>.

rules but where the functioning of the internal market is ensured by mutual recognition. The Regulation lays down definitions, basic principles and obligations covering all stages of food/feed production and distribution. Some of these are also applicable to the special regulatory framework concerning genetically modified food and feed or had been directly implemented into these regulations and directives. Moreover, these principles also apply to food contact materials, which play a major role in the whole food chain as they are used in, for example, the manufacture of food and especially to consume food, such as tableware (e.g. nano-silver coated chopping boards) (Rijk Veraart 2010, 1).

These general principles are:

1. Food safety (Art. 5(1)) by the means of risk analysis (Art. 6) and applying the precautionary principle (Art. 7) and
2. Transparency by the means of public consultation (Art. 9) and public information (Art. 10), as well as, ensuring the protection of consumer interests and providing a basis for consumers to make informed choices (Art. 8).

To uphold food safety, both risk assessment and risk management mechanisms are implemented. This is a direct expression of the precautionary principle and means that risk assessment have to be carried out to rule out risks on basis of scientific evidence by taking into account stakeholder views (Art. 9). If uncertainties are prevailing risk management measures should be applied (Art. 7).

These are for example limited or restricted application of a certain food or food-related product, as well as, risk information or consumer information, for example in the case of allergy related food or food-related products.

Since consumer confidence in the regulatory regime of food or food-related products is crucial for successful product implementation, transparency measures were implemented.

The safety assessment for food lies within the remit of the European Food Safety Authority (EFSA). Also, the EFSA has to assure that transparency measures stated in European Food law are implemented into practice.

According to the EFSA's Communications Strategy: 210-2013 perspective communication is a central part of its core business:

EFSA's Strategic Plan 2009-2013 confirms as a key priority: "...to reinforce confidence and trust in EFSA and the EU food safety system through effective risk communications and dialogue with partners and stakeholders". (EFSA 2010, 2).

In the reaction of partners and stakeholders EFSA is considered to be on the one hand regarded as a good communicator with significant output and a trusted source of information on food risk. On the other hand, some critiques

issued the independency of the Authority. EFSA adopted five key strategic priorities for its work until 2013 to improve its work:

- Simplicity and transparency: Increase relevance and understanding of EFSA communications for key target audiences and informed lay audiences, in co-operation with Member States.
- Independence: Augment proactive communications on the independence of EFSA's risk assessment advice.
- Visibility and outreach: Enhance outreach, in the EU and beyond, by increasing awareness and recognition of EFSA and its role and work as risk assessor.
- Coherence: Further increase the coherence of risk communications across the EU and beyond.
- Dialogue: Enhance dialogue with stakeholders and increase audience interactivity.

The aim is to improve its trustworthiness through increased transparency and openness and comprehensive and coherent information published throughout the EU (EFSA 2010, 6).

Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) aims at ensuring a high protection of human health and the environment as well as the free movement of chemical substances, while enhancing competitiveness and innovation. To ensure safety it therefore introduced a "no data, no market" principle demanding risk related information from importers and producers (Art. 5). Since chemical substances which are imported or manufactured in the EU are further processed to products risk related information is disseminated along the product chain by specific means.¹⁶ REACH directly refers to the precautionary principle in several provisions (e.g. Art. 1(3)).

In comparison to the basic principles for food regulation, REACH also introduces specific risk assessment and management tools to enhance

- chemical safety through risk assessments processes and
- transparency by the means of public consultations and public information.

However, the duty to communicate risks along the product chain ends at the stage of retailers. However, consumers are empowered to demand additional

¹⁶ Besides other instruments implemented directly in the REACH, such as Safety Data Sheets, Regulation (EC) No. 1272/2008 on the classification, labelling and packaging of substances and mixtures (CLP Regulation) is applicable. This will further be regarded in chapter 0.

information from suppliers under specific circumstances (Art. 33(2)). Besides there are rules laying down specific labelling requirements which are also providing information to consumers (see CLP-Regulation). Those rules will be discussed in more detail in chapter 4.3.3.3.

With regard to the risk communication of the ECHA, the Agency in charge to implement REACH¹⁷ provisions, it published a Guidance setting up different approaches for different communication needs (ECHA 2010). In summary, risk communication is treated as an important issue within the ECHA and the overall purpose of risk communication under REACH serves the purpose to

- build trust in cases of routine risks by a proactive approach,
- increase awareness proactively where necessary in cases of uncertainties,
- ensure the public responsively to help their decision-making in controversial cases,
- communicate responsibly where necessary in a crisis situation.

The Guidance document then provides a set of different tools and shows examples how to communicate with the different target groups.

In both regulatory fields, food and chemicals, a special attention is given to the communication of risks. Here, the building of trust is intended to be achieved through transparency of the risk assessment and the risk management processes. This publicly available information is codified in the regulations. In addition to this kind of information the regulations also set up product specific information to be disseminated publicly, too.

The subsequent analysis focuses on regulation with regard to informational provisions, which need to be taken into account to get an overview of information flows provided by law. In line with the focus of the conducted research the analysis focuses on information provisions which are aiming at the information of consumers. Anyway, a broad understanding is applied to determine which kind of information is aiming at consumers. For that reason the subsequent chapter also takes into account information which is available to the general public, for example information from the authorisation processes published by the authority in charge, which possibly is reflected by stakeholders and brought into the realm of the citizens/consumers.

¹⁷ In future the ECHA will also be the Agency in charge for administrative tasks relating to Biocidal Products (see chapter 4.3.1.3).

4.2

Regulation of Genetically Modified Organisms

First of all it is necessary to provide some basic information on the applicable regulations concerning genetically modified organisms (GMOs) in general and GM soy in particular, their definitions, as well as the regulatory aims. As mentioned above, GM soy is used usually as food or feed, therefore EU food law and the special provisions relating to genetically modified food or feed are applicable.

The subsequent chapters take into account the final report "Evaluation of the EU legislative framework in the field of GM food and feed" commissioned by DG Sanco, which was carried out in 2009 and published late 2011 (FCEC 2011). The evaluation collected opinions and perceptions of the examined issues arising under Regulations (EC) No 1829/2003 on genetically modified food and feed and (EC) No 1830/2003 concerning the traceability and labelling of genetically modified organisms and the traceability of food and feed products produced from genetically modified organisms from the point of views of stakeholders and Competent Authorities (CAs).

At the end of this chapter other consumer information related regulations which are not directly aiming at labelling food or feed products.

4.2.1

Specific regulations and regulatory aims

First of all the analysis will be based on the Directive 2001/18/EC on deliberate release into the environment of genetically modified organisms (Directive on Deliberate Release) and then be followed by a discussion on the applicable Regulation (EC) No 1829/2003 of the European Parliament and of the Council of 22 September 2003 on genetically modified food and feed (GMO-food and feed Regulation) and in Regulation (EC) No 1830/2003 of the European Parliament and of the Council of 22 September 2003 concerning the traceability and labelling of genetically modified organisms and the traceability of food and feed produced from genetically modified organisms and amending Directive 2001/18/EC (GMO-traceability regulation).

4.2.1.1

Directive on deliberate release of GMOs

The Directive on Deliberate Release was enacted on 12 March 2001 and repealed Council Directive 90/220/EEC. It approximates the laws, regulations and administrative provisions of the MS and aims at the protection of human health and the environment in accordance with the precautionary principle (Art. 1). It provides a definition of genetically modified organisms (GMOs) and describes which information is required for application in the authorisation

procedure. Moreover, the Directive introduced the “step by step” principle (see Recital 24 of Directive on Deliberate Release):

“This means that the containment of GMOs is reduced and the scale of release increased gradually, step by step, but only if evaluation of the earlier steps in terms of protection of human health and the environment indicates that the next step can be taken.”

For this purpose, the Directive divides two types of deliberate release of GMOs:

- First, for “any other purposes than placing on the market within the community” (e.g. for research purposes) and
- second, “placing on the market genetically modified organisms as or in products within the Community.” (Art. 1)

The second type of deliberate release is of crucial interest for the aims of the SEBEROC research. Here, ‘placing on the market’ does not require a transaction against payment. The provision has a rather broad application. For example, Art. 1, sentence two already applies when a producer or importer transports a shipment containing a GMO to a processing plant.

The definitions given by the Directive are applicable to the special provisions relating to GM food or feed. Given that GM soy is intended to be used as food or feed, special provisions for these kinds of products are laid down in GMO-food and feed Regulation and in the GMO-traceability Regulation. The GMO-food and feed Regulation refers to the Directive on Deliberate Release in some of its provisions relating to the required information for the authorisation of GM food or feed (see Art. 5(5) a) and b) of the GMO-food and feed Regulation).

4.2.1.2

GMO-food and feed Regulation

The GMO-food and feed Regulation entered into force on the 7 November 2003 and is applicable since 7 April 2004 (Art. 49) and introduced a simplified application procedure pursuant to the “*one-door, one-key*” principle: Applicants can seek authorisation for placing on the market of a GMO in accordance with the criteria established by the Directive on Deliberate Release and as GM food and feed in accordance with the criteria established by the GMO-food and feed Regulation (European Commission 2007a). In case of a product which is likely to be used as food and feed, the authorisation procedure ensures that both usages (food and feed) are authorised.

Moreover, it formulates risk assessment and authorisation requirements concerning GMO food and feed, regulates the required application and dictates labelling requirements (Jany 2010, marginal No 3). In Art. 1 a) to c) it lays down three objectives. The objectives are, to:

- (a) provide the basis for ensuring a high level of protection of human life and health, animal health and welfare, environment and consumer interests in relation to genetically modified food and feed, whilst ensuring the effective functioning of the internal market;
- (b) lay down Community procedures for the authorisation and supervision of genetically modified food and feed;
- (c) lay down provisions for the labelling of genetically modified food and feed.

Further provisions on the application are laid down in Articles 1 to 7 of Commission Regulation (EC) No 641/2004 of 6 April 2004 on detailed rules for the implementation of the GMO-food and feed Regulation as regards the application for the authorisation of new genetically modified food and feed, the notification of existing products and adventitious or technically unavoidable presence of genetically modified material, which has benefited from a favourable risk evaluation. In some places this paper will also refer to this Regulation.

A definition of 'genetically modified food and feed' is provided in Art. 2 according to which genetically modified food and feed are food or feed containing, consisting of or produced from GMOs (Art. 2 No 6, 7). This definition is also mirrored in the Art. 3(1) concerning food and Art. 15(1) concerning feed.

'Organism' is defined in Art. 2(1) of Directive on Deliberate Release on the deliberate release into the environment of genetically modified organisms:

"'organism' means any biological entity capable of replication or of transferring genetic material;"¹⁸

The definition of genetically modified organism is mentioned in Art. 2(5), which is itself referring to the definition in Art. 2(2) of Directive on Deliberate Release. Whereas,

"genetically modified organism (GMO) means an organism¹⁹, with the exception of human beings, in which the genetic material has been altered in a way that does not occur naturally by mating and/or natural recombination;

Within the terms of this definition:

- (a) genetic modification occurs at least through the use of the techniques listed in Annex I A, part 1;

¹⁸ Recital (15) of Directive 2991/18/EC states that human beings should not be considered as organisms.

¹⁹ For the definition of „organisms“ see Art. 2(1) of Directive 2001/18/EC: "'organism' means any biological entity capable of replication or of transferring genetic material"

(b) the techniques listed in Annex I A, part 2, are not considered to result in genetic modification;”

Annex I A differentiates techniques of genetic modification (part 1) from other techniques which are normally not considered to result in genetic modification, in particular in vitro fertilisation, natural processes such as conjugation, transduction, transformation, and polyploidy induction (part 2). Annex I B provides that conventional mutagenesis and cell fusion of certain plant cells do not fall under the Directive. ‘Genetically modified organisms’ are therefore organisms whose genetic material had been modified in a way, which doesn’t occur under natural circumstances like reproduction or natural recombination (Jany 2010, marginal No 14). The definitions of ‘food’ and ‘feed’ are laid down in Art. 2 of the Framework Regulation on Food.²⁰

The analysis of the current legal framework provided by GMO-food and feed Regulation and GMO-traceability Regulation firstly comprises of a summary concerning the application for authorisation procedure to highlight the information to be given to the competent authorities and the consultation procedures. The focal part will focus on the consumer information required by the European regulatory framework and on information available to the public.

4.2.2

Authorisation of GMOs in food or feed

Provisions relating to the application for authorisation of GMO food or feed are laid down in Art. 4 to 7 (GMO food) and Art. 16 to 19 (GMO feed) of the GMO-food and feed Regulation. Besides the basic requirements of food and feed with regard to health and environmental safety and to avoid misleading of the public (Art. 4(1) and Art. 16(1)), an authorisation is required for the placing of these products on the market (Art. 4(2) and Art. 16(2)). The applicant has to adequately and sufficiently demonstrate that the food or feed in question satisfies the basic requirements.

For GM food or feed containing GMOs or consisting of GMOs an application according to the one-door, one-key principle must also cover complete technical dossiers supplying the information required by Annexes III and IV to Directive 2001/18/EC. In this case, the environmental risk assessment will have to be carried out in accordance with the principles set out in Annex II of Directive 2001/18/EC.

²⁰ “‘food’ (or ‘foodstuff’) means any substance or product, whether processed, partially processed or unprocessed, intended to be, or reasonably expected to be ingested by humans.”
“‘feed’ (or ‘feedingstuff’) means any substance or product, including additives, whether processed, partially processed or unprocessed, intended to be used for oral feeding to animals;”

Art. 3(1) a) to b) as well as Art. 15(1) a) to c) of the GMO-food and feed Regulation are divided into three categories of genetically modified food or feed (Jany 2010, marginal No 15-17 and 22; Werner Kniel Berg 2004, 5).²¹ Any of these types are subject to the authorisation and supervision procedures, but the content of the application varies.

The special provisions relating to the market authorisation are laid down in Art. 4 et seq. as well as Art. 16 et seq. Information requirements differ depending on the type of product, whether they are

- first, GMO as food or feed, or GMOs as a part (e.g. ingredient) of a food or feed in question; or else
- second, food or feed or an ingredient in this product produced from a GMO.

The applicant submits the application and the required information for the purpose of risk assessment to the national competent authority (Art. 5(2) a) and 17(2) a)). According to Art. 2(3) of Regulation (EC) No 641/2004 on detailed rules for the implementation of the GMO-food and feed Regulation, the applicant clearly indicates those parts of the application which are considered to be confidential, accompanied by a verifiable justification. Moreover, the summary of the dossier (Art. 5(3) j) and 17(3) j)) must be kept in an easily comprehensible and legible form and must not contain parts which are considered to be confidential (Art. 4(2) of Regulation (EC) No 641/2004).

Subsequently the national Competent Authority sends the documents to the European Food Safety Authority (EFSA). The EFSA informs the Member States and the European Commission, makes the application and any supplementary information available to them and makes the summary of the dossier available

²¹ According to (Werner Kniel Berg 2004, 5):

1. GMOs for food or feed use, where the food or feed is the GMO itself, e.g., the GM soy kernel or plant itself, and basic materials, which are able to be used in food or feed (see Art. 3(1) a), 15(1) a) and definitions in Art. 2(8) and (9)).
2. Food or feed containing or consisting of GMOs (Art. 3(1) b), 15(1) b). Such food and feed are considered to be genetically modified food or feed (see definition in Art. 2(6) and (7)). This provision is applicable if the food or feed contains 'living' GMOs, as the term GMO refers to 'organisms' capable of replication or of transferring genetic material.
3. Third, food or feed produced from or containing ingredients produced from GMOs (Art. 3(1) c), 15(1) c)). These are, for example, ingredients which were produced from genetically modified organisms, e.g. from micro-organisms; or meat products from genetically modified cattle. Notably, ingredients which are related to GMOs in an earlier processing stage, e.g. meat from cattle which has been fed with GM feed are not covered. Sugar from GMO sugar beets and vegetable oil from GM soy are therefore considered to be 'produced from GMOs', but for example ascorbic-acid from GM micro-organisms is not.

to the public (Art. 5(2) b) and 17(2) b)).²² Within six months the EFSA verifies the application, formulates its opinion and forwards it to the European Commission, the Member States and the applicant (Art. 6(6) and 18(6)). After deletion of confidential information, the EFSA makes its opinion available to the public via its website²³. Subsequently, members of the public and the Member States may submit comments to the Commission within 30 days (Art. 6(7) and 18(7)).

According to Art. 7 and 19, within three month the EC submits its draft decision to the Standing Committee on the Food Chain and Animal Health (Art. 35(1)), which consists of representatives of the Member States (European Commission 2007b). A qualified majority in the Standing Committee decides whether the draft decision will be accepted or not. In case of acceptance, the decision will be adopted. In case that no qualified majority can be reached for or against an authorisation, the Commission submits a draft decision to the European Council of Ministers, which in turn adopts or rejects the decision within 3 month by qualified majority. If the time period of 3 month is exceeded or no qualified majority can be reached in the Council, the EC makes a final decision whether to accept or reject the application (see Art. 35(2) for the decision procedure).

Authorised GMO food or feed products are allowed to be placed on the market for the period of 10 years (Art. 7(5) and 19(5)) and are entered in the Community register²⁴ of GMO products. The authorisation can be renewed for another 10 years (Art. 11 and 23).

As can be derived of the provisions mentioned above diverse actors are coming into play in course of the application procedure. Applicants are responsible for authorising the GMO according to the requirements and submit a risk assessment dossier. The EFSA evaluates the dossier and makes its opinion available to the public which is then in charge to comment on the opinion. The final decision is then settled by the Commissions Standing Committee which consists of MS representatives. According to this procedure, the decision on the authorisation of GMO is informed by scientific evidence but of political character.

²² By contrast, the application procedure according to Directive 2001/18/EC left more competencies to the Member States. Here, the national competent authority itself verifies the application and its accordance with the law (Roller 2005, 117 et seq.).

²³ See <http://www.efsa.europa.eu/>.

²⁴ See http://ec.europa.eu/food/dyna/gm_register/index_en.cfm (accessed on 12 April 2010). Currently there are two GM soy species authorised for food and feed use. One species is subject to renewal.

There are different critiques to the current authorisation process. From the industry point of view the process is considered to be slow and many hurdles have to be taken. Besides the scientific dimension of the risk assessment of the authorisation a political dimension comes into play when the decision is settled (FCEC 2011, 34). On the other side some NGOs believe that the EFSA is not independent. All in all, there is no major critique on the legislation itself, but the implementation of that legislation which is considered to be ineffective. The risk assessment process itself is not transparent enough, time consuming and do not provide the needed information. Recently the Commission presented a new draft Regulation for the risk assessment of food and feed to improve the risk assessment carried out by the EFSA by legally binding standards (Testbiotech 2012). Moreover, MS votes are not taking into account merits of a GMO on a case-by-case basis, but are voting according to their general stance for or against GMOs on grounds of a political agenda they follow (FCEC 2011, 36).

4.2.3

Information available to the public

Some information gathered during the authorisation process is available to the public and transmitted along the production chain. Those provisions are relating to information dissemination and transparency and were enacted to promote confidence of Community institutions, the general public and interested parties in the EFSA (see Recital 40 of the Framework Regulation on Food). The basic principles of transparency are laid down in Section 2, Art. 9 and 10 of Framework Regulation on Food and are divided into public consultation and public information. As a further basic principle, transparency is included in the special provisions on GMO food and feed legislation especially when it comes to the publication of dossier summaries, as described below.

This section is divided into four subsections. The first subsection shows information which is available to the general public for consultation purposes. The second subsection discusses the informational obligations along the product chain. This means that information has to be transmitted from the original producer of a GMO down to the processor. The third subsection outlines the information given to the consumer via labelling. The fourth subsection discusses further relevant information which are to some extent relevant to the labelling of GMOs in food.

Apart from the information published during consultation these information channels are supposed to enable the consumer to make an informed choice and to facilitate fairness of transactions between seller and purchaser. Moreover, they facilitate the monitoring, the monitoring of potential effects on human/animal health or the environment and the potential withdrawal of these products at all stages of production and on the market. The traceability of GMO food or feed is laid down in GMO-traceability Regulation. Due to Art.

2(1), the Regulation applies to GMOs as food or feed products or food or feed products containing or consisting of GMOs, and food or feed products produced from GMOs at all stages of the placing on the market. Medicinal products are excluded from the scope of this Regulation (Art. 2(2)).

4.2.3.1

Information for the purpose of consultation

A summary of the dossier, which is produced by the applicant, will be made available to the public by the EFSA (Art. 5(3) l) and 17(3) l)). The summary should be easily comprehensible and legible and must not contain parts which are considered to be confidential (see Art. 4(2) of Regulation (EC) No 641/2004).

During the consultation procedure, the EFSA also publishes its opinion, after deletion of any information identified as confidential (Art. 6(7)). Subsequently, the public may submit comments to the Commission within 30 days.

According to Art. 30 of the GMO-food and feed Regulation, confidential treatment of information has to be justified by the applicant. The European Commission takes the final decision after consultation with the applicant. However, some information is considered to be never confidential (Art. 3(3); e.g. the name, the general description and the composition of the GMO and the indication of the substrate and the micro-organism, the name and the address of the authorisation-holder, the physico-chemical and biological characteristics, effects on human/animal health, on the environment).

4.2.3.2

Information along the product chain

The provision relating to the traceability of GMOs as food or feed products or food or feed products containing or consisting of GMOs is laid down in Art. 4 of GMO-traceability Regulation (Jan 2010, marginal No 8).²⁵ At the first stage of placing a GMO food or feed product on the market, the operator²⁶ has to transmit in writing that the product contains or consists of GMOs. Furthermore, he has to state the unique identifiers²⁷ assigned to those GMOs (Art.

²⁵ Although GMO as food- or feed-products are not mentioned, Art. 4(1) and (2) are also applicable.

²⁶ " 'Operator' means a natural or legal person who places a product on the market or who receives a product that has been placed on the market in the Community, either from a Member State or from a third country, at any stage of the production and distribution chain, but does not include the final consumer" (see Art 2(5)).

²⁷ " 'Unique identifier' means a simple numeric or alphanumeric code which serves to identify a GMO on the basis of the authorised transformation event from which it was developed

4(1)). At all subsequent stages, the information is transmitted to the operators receiving the GMO products (Art. 4(2)) or products containing or consisting of GMO mixtures (Art. 4(3)). Every operator has the obligation to store this information for a period of 5 years (Art. 4(4)).

The traceability requirements for food and feed produced from GMOs are laid down in Art. 5 of GMO-Traceability Regulation. An indication of each of the food ingredients or feed material or additive produced from GMOs needs to be transmitted to the purchaser (Art. 5(1)). Even if there is no existing list of ingredients, there must be an indication that the product was produced from GMOs (Art. 5(1) c)). Every operator has the obligation to store this information for a period of 5 years (Art. 5(4)).

Traceability requirements as mentioned above are not applicable in cases where the share of GMO in an ingredient does not trespass a threshold of 0.9 % and where these traces are adventitious or technically unavoidable (Art. 4(8)). The producer has to take appropriate measures to avoid the presence of such GMO.

4.2.3.3

On-package product information

The labelling requirements are laid down in Art. 12 and Art. 24 of the GMO-food and feed Regulation and in the GMO-traceability Regulation.

In order to place GMOs as food or feed products (e.g. GM soy), food- or feed-products containing or consisting of GMOs (e.g. instant meal containing GM soy), or food- or feed-products produced from GMOs (e.g. vegetable oil or lecithin produced from GM soy) on the market, the operator needs to fulfil certain labelling requirements according to Art. 4 et seq of the GMO Traceability Regulation.

However, there is an exception to this rule. In cases where GM ingredients do not exceed a threshold of 0.9 % and if this presence is adventitious or technically unavoidable, labelling is not required (Art. 12(2), 24(2)).

According to the rules set out in the GMO-traceability Regulation, meat, eggs and milk produced from animals which are fed with GM feed are not required to be labelled, because these products do not contain GMOs.

In every case where labelling is required, the words "genetically modified" or "produced from genetically modified (name of the ingredient)" must appear directly in the list of ingredients or in a footnote to the related ingredient (Art. 13 and Art. 25; see example in Figure 9: Example for GMO labelling "contains

and providing the means to retrieve specific information pertinent to that GMO" (see Art 3(4)). See also Regulation (EC) No 65/2004.

genetically modified..."²⁸). The same wording also applies to cases where there is no list of ingredients or where there is no packaging. Here, the information must nevertheless be present on the labelling or the packaging or the information must be permanently and visibly displayed either on the food display or immediately next to it. The information needs to be given in a font sufficiently large to be easily identified and read.

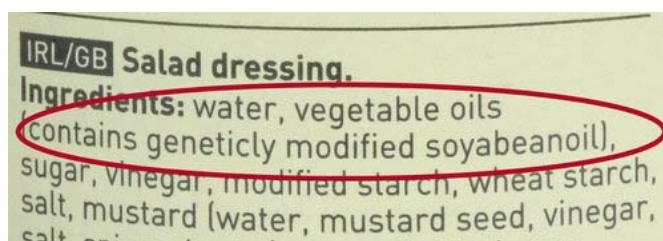


Figure 9: Example for GMO labelling "contains genetically modified..."

To prevent misleading of the consumer, the labelling must also mention any characteristics or properties of the GMO food or feed, which are different from its conventional counterpart or which are likely to cause ethical or religious concerns (Art 13(2) b) and 13(3) and 25(2) c) and d)).

4.2.3.4

Other information available on products

In order to place specific food or feed products on the market, the authorisation may be combined with the condition to carry out post-market monitoring. The reports of this monitoring – excluding confidential information – must also be made accessible to the public (Art. 29(1) of the GMO-food and feed Regulation).

In two European Member States, Germany and Austria, another form of GMO labelling was introduced, which the GMO-food and feed Regulation does not preclude, if it is not misleading: "GM-free". France is expected to be the third country which will make use of such laws and others are supposed to follow (FCEC 2010, 130). In the contrary the use of GM-free labels is prohibited in the Netherlands on grounds that it is misleading, since the thresholds of 0.9% of adventitious and technically unavoidable admixtures set up by the GMO-food and feed Regulation are still applicable. Here, only the phrase "produced without the use of genetic technology" is allowed. In Germany and Austria

²⁸ Taken from

<http://www.klesickfamilyfarm.com/main/wp-content/uploads/2011/09/gm20label.jpg> (accessed on 02.02.2012).

the 0.9% threshold also applies, but the label is allowed. However, to get access to such labels the producer needs to comply with specific GM-free feeding periods, to name just one of such requirements.

The evaluation study commissioned by DG-Sanco that the use of GM-free labels might be misleading since the threshold rules still apply (European Commission 2010, 139). Moreover, both labelling schemes “contains GMO” and “GM-free” might cause confusion among consumers and it might result in an excessive premium for “GM-free” products. A comparable confusion might also occur in relation to “GM-free” and organic labels (European Commission 2010, 141).

Regulation (EC) No 834/2007 of 28 June on organic production and labelling of organic products (repealing Regulation (EEC) No 2092/91; hereinafter the Organic Products Regulation) also addresses the use of GMOs to a certain extent. In general, the Organic Products Regulation bars GMOs from being used in the field of organic products (Art. 4(a) iii),²⁹ with the effect that products exceeding the labelling threshold for adventitious and technically unavoidable presence of GMOs (0.9 %) are no longer considered organic. But this also means that products which are labelled being organic, could in fact contain GMOs under the threshold (Art.23(3), see also European Commission 2010, 141; see the official EU organic farming logo in Figure 10: Official organic farming logo of the European Union).



Figure 10: Official organic farming logo of the European Union

The evaluative study concludes that it is still unclear whether consumers understand the differences between organic and “GM-free”, but the introduction of a harmonised “GM-free” label scheme might be an instrument to provide consumers the possibility to buy GM-free products without paying the

²⁹ With the exception of veterinary medicinal products. See also Art. 9, and 23).

higher premium for organic products. However, there are still doubts with regard to the fundamental concept of "GM-free" since it might be misleading.

4.3

Regulation of nanomaterials

Currently, a variety of legal acts are more or less aiming at the regulation of nanomaterials. In some cases nanomaterials are explicitly addressed. In other cases nanomaterials are covered indirectly. A prominent example for the indirect application of a regulation is the REACH-Regulation, because nanomaterials are in general chemical substances in a nanoform. In cases, where nanoparticles are sold in products, diverse regulations for these products also apply. Although these regulations cover nanomaterials, nonetheless, they do in most cases not yet address the specific properties of nanomaterials. The different regulations which apply directly or indirectly to nanomaterials, respectively nano-silver, are described below.

First the recent developments concerning nanomaterials and nano-products regulation are discussed. During research in the SEBEROC project, many developments have taken place. The next section seeks to put the analysis on the regulatory framework concerning nano-silver in chopping boards into a greater European context.

4.3.1

Specific regulations, definitions and regulatory aims

In the following specific regulations, definitions and regulatory aims are analysed with regard to the applicable regulations on nano-silver as is and nano-silver used in a chopping boards, because for those subjects different laws are applicable. The analysis takes into account recent developments in the field of authorisation procedures, information to be disseminated in the public concerning nano-silver and chopping boards incorporating nano-silver as well as the important questions concerning the definition.

4.3.1.1

Commission Recommendation

With regard to the situation in Europe the discussions and agreements on definitions were crucial for the further development of nanotechnology.

On 18 October 2011 the Commission adopted the Recommendation on the regulatory definition of a nanomaterial.³⁰ According to this Recommendation a "Nanomaterial" means:

³⁰ In contrast to that definition the definition set up by the International Standards Organisation (ISO) is a technical definition (Chemical Watch 2011b).

“A natural, incidental or manufactured material containing particles, in an unbound state or as an aggregate or as an agglomerate and where, for 50 % or more of the particles in the number size distribution, one or more external dimensions is in the size range 1 nm - 100 nm.

In specific cases and where warranted by concerns for the environment, health, safety or competitiveness the number size distribution threshold of 50 % may be replaced by a threshold between 1 and 50 %.

By derogation from the above, fullerenes, graphene flakes and single wall carbon nanotubes with one or more external dimensions below 1 nm should be considered as nanomaterials. ” (European Commission 2011)

This definition strongly influenced the approaches to define nanomaterials in nano-related laws. In the further the relation between REACH and Biocidal Product Laws are discussed.

4.3.1.2 REACH

First of all, the registration of nanomaterials is set out by REACH. REACH follows a substance based approach. This means that the obligations do not directly apply to mixtures and articles, but to the substances contained in them. The aim and scope of REACH is set out in Art. 2(1). Whereby,

“1. [t]he purpose of this Regulation is to ensure a high level of protection of human health and the environment, including the promotion of alternative methods for assessment of hazards of substances, as well as the free circulation of substances on the internal market while enhancing competitiveness and innovation.

2. This Regulation lays down provisions on substances and mixtures within the meaning of Article 3. These provisions shall apply to the manufacture, placing on the market or use of such substances on their own, in mixtures or in articles and to the placing on the market of mixtures.

3. [...]”

According to the “no data, no market” principle in Art. 5, substances or mixtures shall not be manufactured or placed on the market unless they have been registered. Art. 6 states the general registration obligation, whereas every substance must be registered, if produced in quantities of 1 tonne or more per year (per producer or importer).

As the Regulation addresses chemicals in general, the term ‘substance’ also covers nanomaterials (European Commission 2008, 4).³¹ The general obliga-

³¹ Art. 3(1) provides a definition of ‘substance’:

“substance: means a chemical element and its compounds in the natural state or obtained by any manufacturing process, including any additive necessary to preserve its stability and

tions in REACH therefore are applicable as for any other substance, but there are no provisions referring explicitly to nanomaterials: Especially, with regard to risk assessment and how to demonstrate the safe use. Also, the tonnage thresholds which are crucial to determine the safety data submitted to the ECHA for registration purposes are not taking into account nano-related issues. Moreover, it is still unclear whether nanomaterials are to be treated as a different form compared to the conventional, macroscopic form with the result that nanomaterials could benefit from the transitional periods which are applicable for notified substances. A number of different studies assessed the adequacy of REACH with regard to the regulation of nanomaterials respectively nano-silver and identified shortcomings with regard to the points stated above, as well as other issues (Führ et al. 2007, Greßler Fries 2010, BUND 2009, Pronk et al. 2009, Malkiewicz et al. 2011).

The report of the Dutch Institute for Public Health and the Environment (RIVM 2009) concluded that there are difficulties of regulating nanomaterials under REACH and states:

“By conducting a hypothetical registration of nanosilver it was investigated whether REACH is suitable for assessing the safe use of nanomaterials. From this it appeared that no definition of a nanomaterial is present, and that a relevant measure for expressing harmfulness and exposure is as yet not known. In addition, the standard information requirements are insufficient to assess hazard and exposure. They are also insufficient for a proper characterisation of the nanomaterial. Consequently, it cannot be determined to what extent the nanoform of a substance corresponds to the non-nanoform of the same substance. Furthermore, it is unclear whether current risk reduction measures and extrapolation methods in risk assessment, as established for non-nanomaterials, are applicable to nanomaterials.” (RIVM 2009, 3)

Also a recent study funded by the SKEP Network came to the similar conclusion that most REACH provisions and assessment tools are not appropriate to evaluate the safety of nanomaterials (SKEP 2011).

However, there are many exceptions to the registration obligation in REACH, for example for polymers, for waste and for substances for the use in research and development, to the obligation to register the substances before placing them on the market.³² In addition, the regulation of cosmetics, biocides and

any impurity deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition;” Art. 3(2) states the definition of ‘mixtures’:

“mixture: means a mixture or solution composed of two or more substances;”

³² See Art. 9: the registration obligation does not apply to substances listed in Annex IV and V, as well as special provisions apply to isolated intermediates (Art. 17 et seq). Moreover, there

drugs are also subject to specific regulatory regimes. Another problem occurs to define whether a given product is considered to be a biocide, cosmetic or medicine due to the fact that many products are considered to be borderline products (BMG 2010, 40).³³ Notably, antimicrobial substances are considered as biocides and in the food contacts materials sector nano-silver is used for its antibacterial purpose (Quintavalla Vicini 2002, 378 and Chaudhry et al. 2008, 246). Since the boundaries between the products are blurred the decision needs to be taken on a case-by-case basis.

In our case study nano-silver is used in a chopping board for its antibacterial properties, therefore, the application of REACH provisions are exempted to a certain extent and will be discussed in the further analysis if necessary.³⁴ In cases where nano-silver is not used for its biocidal properties REACH registration and authorisation regime applies. Under specific conditions the assessment of environmental and health risks are divided between the FCM and the REACH regime, if a chemical safety assessment must be carried out under REACH (Art. 14(4)a). Health risks are then assessed under the FCM Regulation, whereas the environmental risk assessment is carried out under REACH (for a more detailed discussion see Chemical Watch 2012b).

For nano-silver in chopping boards the exceptions in Art. 56(4) concerning the authorisation requirements and Art. 15(2) concerning the registration requirements are applicable, whereas

“Active substances manufactured or imported for use in biocidal products only and included either in Annexes I, IA or IB to Directive 98/8/EC of the European Parliament and of the Council of 16 February 1998 concerning the placing of biocidal products on the market (1) or in Commission Regulation (EC) No 2032/2003 [2nd Review Regulation, recently replaced by Commission Regulation (EC) No 1451/2007] on the second phase of the 10-year work programme referred to in Article 16(2) of Directive 98/8/EC, until the date of the decision referred to in the second subparagraph of Article 16(2) of Directive 98/8/EC, shall be regarded as being registered and the registration as

are more exceptions in Art. 2. These exceptions and specialties in REACH are not further discussed.

³³ The same applies in the food sector between food, medicine and cosmetics (Chaudhry et al 2008, 243).

³⁴ Still applicable are provisions relating to the information obligations in the production chain (CLP-Regulation and Title IV REACH), specific risk assessment requirements, identification and naming of the substance and applying IUCLID. Moreover, any use of active substances outside the Biocidal Products Directive can also fall within the scope of REACH. The tonnage used for non-biocidal applications must be registered separately (see Chemical Watch 2007 and European Commission 2009). Some of those provisions will be regarded in the subsequent sections.

completed for manufacture or import for the use in a biocidal product and therefore as fulfilling the requirements of Chapters 1 and 5 of this Title.” (Art. 15(2))

Biocides included in the Annexes of Directive 98/8/EC or subject to the 10-year³⁵ work programme set up by the Commission Regulation (EC) No 1451/2007 are regarded as being registered and are not subject to authorisation under REACH (see also Raupach 2011, 256 et seq.). In the Biocidal Products Directive specific provisions are relating to the authorisation of those products. Silver is considered to be an existing biocidal substance and is currently subject to the evaluation programme. The designated authority is the Swedish Chemicals Agency, which is also taking into account textiles treated with nano-silver (KEMI 2011).

Since the current Biocidal Products Directive does not differ between substances in bulk form and substances in the nano-form, nano-silver is regarded being registered and registration requirements under REACH do not apply for nano-silver as an active substance.

The Biocidal Products Directive is currently under revision and will in future also take into account specific properties of an existing substance when used in a nanoscale.

4.3.1.3

Biocidal Products Directive and the new Biocidal Products Regulation

The regulatory aim of the Biocidal Products Directive is to harmonise the European market for biocidal products and their active substances and at the same time to provide a high level of protection for humans, animals and the environment. For that purpose it sets up requirements for authorisation and placing on the market of biocidal products (Art. 1(1) a)). According to Art. 2(1) a) biocidal products are

“Active substances and preparations containing one or more active substances, put up in the form in which they are supplied to the user, intended to destroy, deter, render harmless, prevent the action of, or otherwise exert a controlling effect on any harmful organism by chemical or biological means.

An exhaustive list of 23 product types with an indicative set of descriptions within each type is given in Annex V.”

Active substances are defined in Art. 2(1) d):

“A substance or micro-organism including a virus or a fungus having general or specific action on or against harmful organisms.”

The Biocidal Products Directive does not take into account nanoscale substances, but a revision is currently taking place. The regulation of biocides will

³⁵ In the meantime prolonged to 14-years (Raupach 2007, 261).

therefore fall under the new Biocidal Products Regulation³⁶ which will presumably come into force by mid-2012. The position of the European Parliament adopted at second reading on 19 January 2012 was agreed by the Council and contains the European Commission Recommendation on the definition of nanomaterials as stated above. Especially with regard to the nano-related provisions the adoption of the document seems very likely (Chemical Watch 2012a).

The current text addresses uncertainties of nanomaterials (Recital 66) by establishing a specific approval of the active substance in nanoscale, separate risk assessment based on adequate methods and labelling.

The application for authorisation of a biocidal product at EU level will be in the scope of the duties of the ECHA from 2013 on with a transitional period until 2020.

Moreover, articles releasing active substances or incorporating active substances are considered as "treated articles"³⁷ by the new Biocidal Products Regulation and were also subject to the Biocidal Products Directive. With the new Regulation the scope of "treated articles" is widened and also covers nano-silver chopping boards (being food contact materials). The active substances will therefore be assessed and approved with regard to health and environmental risks under the upcoming Biocidal Products Regulation. The Regulation also covers specific labelling provisions with regard to nanomaterials.

In the current applicable BPD, nano-silver chopping boards could be considered as a treated article. Anyway, according to Art. 1(2) j) of the BPD, products like chopping boards which are considered food contact materials are not subject to the scope of the BPD. Nano-silver as an active substance lies within the scope of the BPD. Besides the Biocidal Products legislation covering the authorisation of active substances in biocidal products further provisions apply with regard to the use of nano-silver in chopping boards. The regulation on Food Contact materials and related regulations are applicable.

³⁶ Position of the European Parliament adopted at second reading on 19 January 2012 with a view to the adoption of Regulation (EU) No .../2012 of the European Parliament and of the Council concerning the making available on the market and use of biocidal products, P7_TC2-COD(2009)0076.

³⁷ According to Art. 3(1) l) "'treated article' means any substance, mixture or article which has been treated with, or intentionally incorporates, one or more biocidal products" if its primary function is not biocidal (Art. 3(1) a)).

4.3.1.4

Food Contact Materials

The specific consideration of the risks to human health with regard to the use of nano-silver in chopping boards is carried out by the Framework Regulation on Food Contact Materials and Articles (FCM Regulation).³⁸

The purpose of this Regulation is to ensure the effective functioning of the internal market when placing FCM-products on the market while providing the basis for securing a high level of human health and the interests of consumers (Art. 1(1)). Two basic principles apply for all FCMs (Rijk Veraart 2010, 2):

1. Principle of inertness
2. Principle of safety

Specific provisions were set up for different product groups.

The FCM-Regulation is not directly taking into account nanomaterials, but the related Regulation (EC) No. 450/2009 on active and intelligent food contact materials (AIM-Regulation) and the Regulation (EU) No 10/2011 of 14 January 2011 on plastic materials and articles intended to come into contact with food (PIM-Regulation) are.

AIM-Regulation

The AIM-Regulation applies to plastic products and products which incorporate active and intelligent food contact materials, such as kitchenware or packages which release substances to the food for different purposes (e.g. extending shelf life).³⁹

Notably, Recital 14 of the AIM-Regulation states:

“New technologies that engineer substances in particle size that exhibit chemical and physical properties that significantly differ from those at a larger scale, for example, nanoparticles, should be assessed on a case-by-case basis as regards their risk until more information is known about such new technology. Therefore, they should not be covered by the functional barrier concept.”

According to Art. 5(2) c) ii), “substances deliberately engineered to particle size which exhibit functional physical and chemical properties that significantly

³⁸ Regulation (EC) No 1935/2004 of the European Parliament and the Council of 27 October 2004 on materials and articles intended to come into contact with food and repealing Directives 80/590/EEC and 89/109/EEC.

³⁹ Active food contact materials are materials that actively maintain or improve the condition of the food. Intelligent food contact materials are materials that are designed to monitor the condition of the food (see Regulation (EC) No. 1935/2004 Recital 4).

differ from those at a larger scale” have to be authorised, even if they are not in direct contact with food. Moreover, active food contact materials which are actively maintaining or improving the condition of the food have to comply with the provisions of Directive 89/107/EEC on food additives, which was repealed and replaced by Regulation (EC) No1333/2008 (Art. 4 of Regulation 1935/2004).

Active FMs are intended to extend the shelf-life or to maintain or improve the condition of packaged food (Art. 2(2) a)). This seems to be not problematic for food packaging, but could be questionable for nano-silver chopping boards which are not improving the shelf life of a food prepared on it but only providing a surface which is antimicrobial.

However, as nanoparticles are supposed to be used, for example, in plastics, the PIM-Regulation is nonetheless applicable.

PIM-Regulation

The recently adopted PIM-Regulation takes nanoform substances into account. It mentions

“new technologies that engineer substances in particle size that exhibit chemical and physical properties that significantly differ from those at a larger scale, for example, nanoparticles” (Recital 23)

It demands a risk assessment on a case-by-case basis and nano-scale substances shall only be used if explicitly authorised and mentioned in Annex I (Art. 9(2)). Derogation from this list is not allowed, even if the nanomaterial is not in direct contact with the food (Art. 13(4) b), 14(3) b). Currently there are three nanomaterials listed in the positive list: titanium nitride, silicone dioxide and carbon black. Nano-silver is not mentioned in the list.

Notably, PIMs which were placed on the market before 1 January 2012 and which do not comply with this Regulation can remain on the market until 1 January 2013. Those plastic materials and articles may remain on the market until the exhaustion of stocks (Chemical Watch 2011).

4.3.2

Authorisation of nano-silver respectively nano-silver chopping boards

Under the current BPD regime active substances must be approved and Biocidal Products consisting of active substances must be authorised. The system was also introduced in the new Biocidal Products Regulation. With regard to the application of those active substances and biocides in chopping boards, the latter product must additionally be authorised as food contact material. Here, the PIM-Regulation will be discussed.

4.3.2.1

Approval and authorisation of nano-silver

The Biocidal Products Directive BPD 98/8/EC regulates the placing of biocidal products on the market in a two step procedure. The first step is evaluation of the active substances contained in a biocidal product at EU level and the second step is the biocidal product authorisation at the member state level. A list of 23 product types with an indicative set of descriptions within each type is given. Active substances are divided into new and existing active substances, defined by the date of implementation (14.3.2000). New active substances have to be evaluated before they can be placed on the market; existing active substances go through a review programme and can stay on the market. The review programme was established via several regulations; the latest is Regulation (EC) No 1451/2007. Silver with microbial properties is falling under the review programme.

A request of the European Parliament concerning the inclusion of nano-silver in the Annex I or IA of BPD was answered on 19.11.2009⁴⁰, therein the Commission states:

- silver compounds are currently assessed by the rapporteur member state Sweden under the review programme⁴¹ established by the Directive
- if the assessment results in the inclusion of silver in Annex I or IA, this would cover nano-silver as well.
- risks related to the nano-sized silver would then be assessed in the biocidal products authorisation process.

For instance placing on the market of silver electrodes as part of washing machines (or to replace spent electrodes) to generate silver ions via electrolysis is covered by the BPD and would fall under PT 2 "Private area and public health area disinfectants and other biocidal products", as the washing machine is supposed to be used in private areas.

The current use of silver compounds in articles such as napkins, underwear, socks and drinking bottles for anti-microbial purposes is regulated by the BPD as long as treated with such compounds to control harmful organism outside the article. For the duration of the review programme, biocidal products con-

⁴⁰ See

<http://www.europarl.europa.eu/sides/getAllAnswers.do?reference=E-2009-4397&language=DE> (accessed on 25 May 2010).

⁴¹ See

http://eurolex.europa.eu/LexUriServ/site/en/oj/2007/l_325/l_32520071211en00030065.pdf#page=37 (accessed on 25 May 2010).

taining nano-silver can continue to be placed on the market in the Member States in accordance with their national legislation.

No evaluation dossier for silver could be found on the CIRCA library webpage (2.2.2012)⁴², so it is supposed that the evaluation report is still unpublished.

With the upcoming Biocidal Products Regulation the situation stated in the answer of the European Parliament will change. However, with regard to the current evaluation done by the rapporteur member state Sweden transitional measures of the new BPR are applying. Given the fact that the current Directive does not differ between silver in the nano-scale and the macro-scale the approval or non-approval of silver will cover both forms.

By referring to substances currently evaluated by the 10-year work programme under the BPD⁴³ Art. 89(2) states that MS are allowed to continue to apply their current systems of practices of authorisation of making a given biocidal product available on the market until two years after the date of approval of the last of the active substances in that biocidal product. There are also possibilities foreseen to making available biocidal products in case of non-approval. The last period will last no longer than 12 months.

That means that there might be possibilities in a period between 1 and 2 years after the decision is settled and in which MS are allowed to have on the market nano-silver chopping boards without a nano-related risk assessment, as well as, the new system of labelling (this will be discussed in detailed in chapter 4.2.3). However, it is currently not sure how this will affect the marketing of nano-silver chopping boards in the transitional period, since the safeguard clause (Art. 88) enables MS also to take provisional measures on basis of new evidence that a BP constitutes a serious immediate or long-term risk to human, animals or the environment. Those provisional measures are subject to a final approval of the EC. Notably, environmental NGOs are not fully satisfied with the regulation because of the different provisions relating to exemption and derogation clauses.⁴⁴

The Regulation will also offer clear advantages with regard to nanomaterials. They will have to be approved as active substances on their own unless it is explicitly mentioned otherwise (Art. 4(4)). Here, the regulation draws a clear distinction between macro-scale substances and nano-substances. With a view on biocidal products containing active substances in a nano-scale separate risk assessment requirements are foreseen (Art. 19(1) f)). Moreover, the

⁴² See http://circa.europa.eu/Public/irc/env/bio_reports/library (accessed on 25 May 2010).

⁴³ See Regulation (EC) No 1451/2007 of 4 December 2007 on the second phase of the 10-year work programme referred to in Article 16(2) of Directive 98/8/EC.

⁴⁴ See <http://www.env-health.org/spip.php?article1367> (accessed on 02.02.2012).

simplified authorisation procedure for low-risk biocidal products is ineligible for those products containing nanomaterials (Art. 25 c)). REACH test methods described in Regulation (EC) No 440/2008 of 30 May 2008 shall be applied for the approval of biocidal products. When those test methods are applied to active substances considered as NMs an explanation shall be provided of their scientific appropriateness for nanomaterials, and where applicable, of the technical adaptations/adjustments that have been made in order to respond to the specific characteristics of these materials (Annex II (5) and Annex III (5)).

The approval of active substances is laid down in Art. 4 et seq. The applicant submits his application to the ECHA which in turn informs the member states. The validation of the submitted data is then carried out by the evaluating competent authority (Art. 7). The application is then evaluated within one year, submitted to the ECHA by giving the applicant the possibility to comment on the draft (Art. 8(1)). When preparing its opinion on the approval of an active substance, the ECHA shall examine if the active substance in question shall be considered as a candidate for substitution. Those substances are, for example substances which meet one of the exclusion criteria listed in Art. 5(2) and therefore could be harmful (more criteria are listed in Art. 10(1)).⁴⁵ Within 270 days the ECHA submits its opinion to the Commission. Prior to submitting its opinion to the Commission the ECHA makes potential candidates for substitution publicly available and performs a public consultation with a period of 60 days to comment (Art. 10(3)).

4.3.2.2

Authorisation for nano-silver chopping boards

The provisions laid down in the FCM-Regulation are of mere general nature. The content of the authorisation dossier is laid down in Art. 9. Thereof, the application contains information to identify the applicant and the substance. A technical dossier and its summary needs to be submitted containing the information specified in the guidelines for the safety assessment of a substance. These guidelines are published by the EFSA and will be further discussed under the specific regulations.

The PIM-Regulation which is additionally applicable for every plastic food contact material sets up migration limits (Art. 11 and 12) and foresees a declaration of compliance by the producers and manufacturers in the production chain (Art. 15). The information requirement covers the Identity of manufacturer or importer, the identity of material, article, intermediate or substance, the date of declaration, the confirmation to meet relevant legal requirements,

⁴⁵ For example, carcinogenic, mutagenic, reproduction toxicity, endocrine disrupting, persistent, bio-accumulative and toxic (PBT) or very persistent and very bio-accumulative (vPvB), etc.

the adequate information on substances with restrictions, the information on specifications of use, and specific information if a functional barrier is present (see Annex IV). This declaration is accompanied by supporting technical documents, which contain the conditions and results of testing, calculations, including modelling, other analysis, and evidence on the safety or reasoning demonstrating compliance (Art. 16(2)).

General requirements for authorisation of the products in questions are laid down in Art. 8 et seq. of the FCM-Regulation. According to Art. 9 the application is submitted to the competent authority of the Member State concerned, which in turn sends this application to the EFSA. These documents are then made available to the other Member States, the Commission. Within 6 month the EFSA gives an opinion and further comments on the designation, restrictions and the analytical method (Art. 10). A positive decision of the Commission results in a Community authorisation (Art. 11). An entry into a Community register of authorised substances, processes, or materials or articles is foreseen (Art. 5 m)). These approved substances, processes, or materials or articles are allowed to be used by any producer by taking into account the requirements of usage (Art. 11(4)). This procedure generally applies to all plastic food contact materials.

The FCM-Regulation does not foresee consultation or the involvement of the public in any form. Anyway, by taking into account the EFSA's approach on Public Consultations on scientific outputs⁴⁶ consultation lies within the scrutiny of the Authority. Public consultation is according to this document not foreseen for scientific opinions of the Scientific Committee and/or Panels on the so called regulated substances and especially not on opinions on applications under the FCM-Regulation. However, there is a vague suspicion, that third party comments could be indirectly relevant for the decision of the Commission. In the event that the Commission decides on a substance, Art. 11(2) states that it has to take into account, among other,

“other legitimate factors relevant to the matter under consideration”.

This seems to be evidence, that third party opinions could also be involved into the decision-making process. However, the process itself does not provide any point of direct inclusion of third party views of a pending authorisation.

4.3.3

Information available to the public

The following section focuses on the information available to the public (e.g. in course of the application procedure or product information) and information, which is transmitted through the production chain. Here, several Regula-

⁴⁶ See

<http://www.efsa.europa.eu/en/keydocs/docs/consultationpolicy.pdf> (accessed 02.02.2012)

tions need to be considered. Additionally, the on-package product information provisions are discussed, as well as other information available to the public stemming from other regulations and taking into account nanomaterials.

4.3.3.1

Information for the purpose of consultation

Since the current Biocidal Products Directive is subject to revision and silver is currently evaluated in the 10-year review programme the following analysis concentrates on the upcoming Biocidal Products Regulation and the FCM-Regulation by taking into account the PIM-Regulation.

Biocidal Products Regulation

The ECHA makes publicly available information concerning Biocidal products and active substances (Art. 66, 67). The new BPR acknowledges provisions of Regulation (EC) No 1049/2001 of the European Parliament and of the Council of 30 May 2001 regarding public access to European Parliament, Council and Commission documents in Art. 66 and grants access to submitted data after authorisation. The data covers the identity of the authorisation holder and manufacturer the content of the active substance or biocidal product, specific substance or product data like physical or chemical data, safety data sheets, test results and more. Anyway upon justification the submitter of the data has the possibility to demand nondisclosure or sensitive data. After approval of an active substance the name of substance (ISO, IUPAC nomenclature, EINECS), CLP and criteria, endpoints, pathways, environmental fate and behaviour, results of toxicological and ecotoxicological study, exposure level (PNECS), guidance on safe use and analytical methods are placed on the website of the ECHA. After authorisation of a BP terms and conditions of authorisation, summary of the BP characteristics and analytical methods are placed online. The applicant has, however, the possibility to justify nondisclosure of data which might be harmful for his commercial interests (Art. 66(4)). Those provisions are similar to the provisions laid down in REACH.

FCM-Regulation

Applications for authorisation, supplementary information from applicants and opinions from the Authority, excluding confidential information (see Art. 20), shall be made accessible to the public in accordance with Articles 38, 39 and 41 of Regulation (EC) No 178/2002 and Articles 2, 4, 7, 8 and 10 of Regulation (EC) No 1049/2001 on access to documents (See Art. 19 and EFSA 2011, 12).

According to Art. 10(6) the opinion of the EFSA is made public after deletion of any confidential information (Art. 20). An approved substance will be en-

tered into the Community Register⁴⁷. Currently there are three nanomaterials listed:

- Silicon dioxide, For synthetic amorphous silicon dioxide: primary particles of 1 – 100 nm which are aggregated to a size of 0,1 – 1 µm which may form agglomerates within the size distribution of 0,3 µm to the mm size;
- Titanium nitride, nanoparticles, No migration of titanium nitride nanoparticles. Only to be used in PET bottles up to 20 mg/kg. In the PET, the agglomerates have a diameter of 100 – 500 nm consisting of primary titanium nitride nanoparticles; primary particles have a diameter of approximately 20 nm;
- Carbon Black, Primary particles of 10 – 300 nm which are aggregated to a size of 100 – 200 nm which may form agglomerates within the size distribution of 300 nm – mm. Toluene extractables: maximum 0,1 %, determined according to ISO method 6209. UV absorption of cyclohexane extract at 386 nm: < 0,02 AU for a 1 cm cell or < 0,1 AU for a 5 cm cell, determined according to a generally recognised method of analysis. Benzo(a)pyrene content: max 0,25 mg/kg carbon black. Maximum use level of carbon black in the polymer: 2,5 % w/w.

Moreover, any applications and supplementary information from the applicant are published under exclusion of confidential information. Information excluded from confidentiality is the identification of the applicant and the chemical substance, as well as information of direct relevance to the assessment of the substance and the analytical methods (Art. 20(2)).

4.3.3.2

Information along the product chain

Currently, there is no mandatory product information system for products on the market containing nano-materials in the EU. Therefore, the considerations in the following section are focussing on the upcoming provisions.

In the upcoming BPR there are different instruments foreseen to communicate that the active substance or the biocidal product contains or is a nanomaterial. Concerning the Safety Data Sheet which is especially used to communicate substances' safety along the production chain the BPR is referring to Art. 31 REACH (Art. 70 BPR). With Art. 31 REACH aims at ensuring safety information dissemination along the product chain. This information down the chain

⁴⁷ See

https://webgate.ec.europa.eu/sanco_foods/main/?event=display (accessed on 20 April 2010).

needs to be provided at least to the retailer of substances. The safety data sheet must be provided by the supplier of a substance or a mixture to the recipient (downstream⁴⁸ user and distributor⁴⁹), if the substance is

- classified as dangerous; or
- persistent, bioaccumulative and toxic or very persistent and very bioaccumulative; or
- included in the candidate list of substances of very high concern.

In the near future, an active substance will be labelled according to the CLP-Regulation⁵⁰. The Regulation was enacted to introduce the GHS (Globally Harmonized System) into the European territory (Steffensen Below Merenyi 2009, 66). The Regulation came into force on 20 January 2009 and will replace the current provisions of the Dangerous Substances Directive 67/548/EEC (DSD) and the Dangerous Preparations Directive 1999/45/EC (DPD) in a stepwise approach; the latter directives will finally be repealed on 1 June 2015 (ECHA 2011a, 2). The label set up with CLP serves the purpose to inform all those who handle the chemical about its hazards. Labelling is mandatory, if the substance or mixture is classified as hazardous or if the mixture contains one or more substances classified as hazardous above a certain threshold (Art. 3 and Art. 9 et seq.). According to Art. 17 et seq., the information on the label should include the following elements: information, concerning the identity of the supplier, the quantity of the substance or mixture and where applicable hazard pictograms, signal words, hazard and precautionary statements and a section for supplementary information. The information shall be held in the official language of the Member State concerned. The supplier has the possibility to use more languages. These information are standardised and in accordance with the classification of the hazardous substance or mixture. CLP states requirement of the label design and its location on the package, as well as requirement to the package to ensure readability and a safe use of the substance, mixture or article. Since 1 December 2010,

⁴⁸ “downstream user: means any natural or legal person established within the Community, other than the manufacturer or the importer, who uses a substance, either on its own or in a mixture, in the course of his industrial or professional activities. A distributor or a consumer is not a downstream user. A re-importer exempted pursuant to Article 2(7)(c) shall be regarded as a downstream user;” (Art. 3(13)).

⁴⁹ “distributor: means any natural or legal person established within the Community, including a retailer, who only stores and places on the market a substance, on its own or in a mixture, for third parties;” (Art. 3(14)).

⁵⁰ Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006.

CLP applies to substances and replaces the Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances. The Directive 1999/45/EC of the European Parliament and of the Council of 31 May 1999 concerning the approximation of the laws, regulations and administrative provisions of the Member States relating to the classification, packaging and labelling of dangerous preparations will be affected only as of 1 June 2015. At this point in time both frameworks will be repealed.

The information collected via authorisation is used to classify the substance in different categories indicating the danger of the substance. These categories are defining the danger to human health and/or the environment. According to Art. 69 of the BPR the CLP provisions will be flanked by a special requirement for nanomaterials. Besides the basic requirement that such labels should not be misleading in respect of risks of a BP or active substance, as well as, the efficacy of the substance or product, the substance name shall be followed by the word nano in brackets. Moreover, any specific related risks shall be mentioned.

Nano-silver itself or a specific mixture of active substances and therefore a biocidal product must be labelled according to these measures so that the manufacturer or the nano-silver chopping board gets the required information.

4.3.3.3

On-package product information

Special labelling requirements for placing on the market treated articles are laid down in Art 58 BPR. In addition, special labelling rules apply stemming from the FCM-Regulation and related laws.

Biocidal Products Regulation

According to Art. 58 BPR in the case of treated articles, like chopping boards, containing nano-silver, a statement that the treated article incorporates biocidal products, biocidal property attributed to the article and the name of the active substances contained in the biocidal products have to be labelled. Notably, the name of the nanomaterials contained should be shown on the label followed by the word 'nano' in brackets (Art. 58(3) d)). Additionally, any relevant instruction for use and, if relevant, precautions should be mentioned.

The labelling requirement does not apply where at least equivalent labelling requirements to meet information requirements concerning those active substances already exist under sector-specific legislation. The applicable regulations on food contacts materials do not require labelling nanomaterials in products; therefore it is questionable if those information requirements are

considered to be equivalent. Since the new Biocidal Products Regulation aims at giving consumers specific information via labels to ensure an informed choice (see recital 53) and labels should contain nano-related information, in future, the FCM-logo as described in the following section will have to be flanked by nano-specific information for treated products.

Food Contact Materials

According to Art. 15 of the FCM-Regulation the labelling requirements consist of the word 'for food contact' or a specific indication (e.g. a pictogram – see Figure 11: Pictogram for FCMs), if necessary, further instructions to be observed for safe and appropriate use, identification information concerning the product and the responsible natural or legal person and an adequate labelling to ensure traceability of the material or article (according to Art. 17).



Figure 11: Pictogram for FCMs

Moreover, the information should be conspicuous, clearly legible and indelible as to be easily understood by purchasers, including consumers (Art. 15(2) and (3)) it shall be displayed on the article or on the package, or on a label affixed to it (Art. 15(7)).

The PIM-Regulation does not stated labelling provisions. Therefore, the provisions in the FCM-Regulation apply. However, no nano-related information are foreseen.

4.3.3.4

Other information available on products

Since the consumer awareness of nano-products on the market is strongly dependent on perceivable products which could be identified incorporating nanomaterials, further regulations are regarded which are not directly subject to the case study based on the nano-silver chopping board example. The following discussion shall give a brief description on nano-related product labelling developments in the EU.

In sector specific regulation further definitions and product information rules were developed. The Regulation (EC) No 1223/2009 of the European Parliament and of the Council of 30 November 2009 on cosmetic products sets out special provisions for nanomaterials in consumer products and gives a definition of 'nanomaterials', which is not in line with the Recommendation of the Commission. The Regulation states:

“‘nanomaterial’ means an insoluble or biopersistent and intentionally manufactured material with one or more external dimensions, or an internal structure, on the scale from 1 to 100 nm;” (Art 2 k)

The new Regulation on cosmetics was one of the first legal acts defining nanomaterials. Nevertheless, more Regulations are directly or indirectly taking into account the use of nanotechnology in products or in their production.

A proposal⁵¹ to the Novel Food Regulation (EC) 258/97⁵² also included special requirements for nanomaterials for the use in food. The proposal stated that “foods modified by new production processes, such as nanotechnology and nanoscience, which might have an impact on food”⁵³ should be considered as being novel. Moreover, the procedure of food safety assessment was proposed to be centralised on EU-level. Therefore, applications for the approval of novel foods would have to be submitted to the Commission and then directed to EFSA.⁵⁴ The attempted revision failed because of a dissent regarding the treatment of food from cloned animals (Schenten 2011). The current Regulation on Novel Foods will therefore remain in force.

The new EU Regulation EC No 1169/2011 on the provision of food information which will apply from December 2014 to consumers considerably changes existing legislation and explicitly takes into account nanomaterials. According to the definition in Art. 2(2) t)

“‘engineered nanomaterial’ means any intentionally produced material that has one or more dimensions of the order of 100 nm or less or that is composed of discrete functional parts, either internally or at the surface, many of which have one or more dimensions of the order of 100 nm or less, including structures, agglomerates or aggregates, which may have a size above the order of 100 nm but retain properties that are characteristic of the nanoscale.

⁵¹ See COM(2007) 872 final, Proposal for a Regulation on novel foods and amending Regulation (EC) No 258/97.

⁵² Regulation (EC) No 258/97 of 27 January 1997 concerning novel foods and novel food ingredients, OJ L 43 of 14 February 1997.

⁵³ COM(2007) 872 final, Proposal for a Regulation on novel foods and amending Regulation (EC) No 258/97, p. 10.

⁵⁴ COM(2007) 872 final, Proposal for a Regulation on novel foods and amending Regulation (EC) No 258/97, p. 7

Properties that are characteristic of the nanoscale include:

- (i) those related to the large specific surface area of the materials considered; and/or
- (ii) specific physico-chemical properties that are different from those of the non-nanoform of the same material;”

The definition shall if necessary be adapted (Art. 18(5)). Currently it deviates from the definition set up by the European Commission.

Ingredients in the form of engineered nanomaterials shall be clearly indicated in the list of ingredients followed by the word ‘nano’ in brackets (Art. 18(3)).

4.4

The assumed contribution of the actors to the regulatory aims

4.4.1

Regulation as guideline for actor behaviour

The regulation of both nanotechnology and GMOs is designed to ensure that various relevant actors contribute to the realisation of the regulatory aims. For example, producers and manufacturers are required to provide information and to put adequate safety measures into place; experts and the public are expected to critically assess information provided during the approval procedures; actors along the value chain, in particular wholesalers and retailers have to pass on information; and consumers are expected to critically assess information and exert informed consumer choice in line with their preferences.

While the regulatory arrangements create opportunities for some actors, they place burdens on others. The regulatory framework can also influence the distribution of market power along the value chain. The actual regulations will therefore always reflect compromises between diverging interests, based on the knowledge and understanding available at the time when legislation is enacted. The application of generalised principles is supposed to limit regulatory discretion and to help develop a coherent and non-discriminatory regulatory framework.

Against this background, the review of the regulatory requirements for products made by genetic engineering and nanotechnology has found important commonalities but has also pointed to significant differences.

4.4.2

Emerging versus consolidated regulatory frameworks

The regulation of genetically modified organisms has been harmonised in several pieces of European legislation which cover the entire product life cycle from research and development to marketisation and handling along the value chain. Transparency and information have been stringently established as regulatory aims besides consumer and environmental safety. Procedures

have been streamlined to a certain degree, following the “one door, one key” principle. European regulation leaves only limited policy space for member states to introduce further measures such as safeguard clauses and GMO-free labels. European harmonisation was probably alleviated by the fact that GMOs predominantly occur in food and feed products (with further potential applications for the production of bio-energy and fibres). Hence, the range of GMO applications is rather narrow compared to nanotechnology. The Commission-sponsored “Evaluation of the EU legislative framework in the field of GM food and feed” (FCEC 2011) has openly questioned some of the national policy space, suggesting that GM-free labels were potentially misleading consumers and that the uneven implementation of such labels across member states created barriers to market entry.

In contrast, the regulation of nanomaterials and products from nanotechnology poses a more complex problem due to the wide range of potential applications. As a result, nano-materials and products are now covered by a series of sector specific regulations. However, the definition of “nano” varies across these different pieces of legislation, partly reflecting the emerging stages of understanding of this technology. By publishing a supposedly general definition of nanomaterials in October 2011, the European Commission has stepped up its efforts to consolidate the concept of nanomaterials for regulatory purposes, a move that can probably be understood as one step towards a more coherent approach to risk management of nanomaterials across various product groups. However, currently the consultation and information requirements vary across different product groups so that a uniform procedure in line with the “one door, one key” principle in place for GMOs appears less achievable for nano-materials. In order to assess the impact of the emerging regulatory framework for nano-materials and products, our analysis has identified the risk assessment, communication and labelling requirements for nano-silver as a material and for its use in chopping boards. One of the challenges for such a product specific impact assessment is to determine the appropriate methods of risk assessment for single products; the Biocidal Products Regulation, for example, requires that the assessment of risks has to embrace the latest methodologies.

At this point in time it remains to be seen whether the more fragmented regulatory landscape for nano-materials and products as compared to GMOs reflects an earlier state in the consolidation of an emerging regulatory approach or a broader range of applications with very different implications for the general regulatory aims.

4.4.3

Regulatory aims

European regulation of GMO and nano-materials and products aims to ensure that products on the market are **safe for human health and the environment**.

Some pieces of regulation, e.g., the new Biocides Regulation or GMO regulation on feedstuffs, also address **animal health**. For any European regulation, the **functioning of the internal market** is another overarching aim, requiring that regulation should not create barriers to the free circulation of approved substances and products in the single market.

Transparency, consumer information and enabling consumer choice is a second set of aims embodied in a range of European regulations, prescribing minimum standards for consumer information on the product and aiming to ensure that consumer **information is trustworthy and not misleading**. On-product information and labels are accompanied by further information accessible to the general public through different channels, aiming to back-up **confidence in product information** and consumer **trust in the framework of product authorisation**.

4.4.4

Relevant actors and their expected contributions

In this section we discuss which behavioural requirements are included in the regulatory framework. The discussion focuses on the two exemplar products, margarine containing GM soy and a chopping board containing nano-silver.

The regulatory framework for both products specifies expectations towards the **producers** of the product which cover all stages from product authorisation to placing products on the market and product monitoring. Producers have to provide product information and risk assessments when applying for authorisation to use GM soy in foodstuff or nano-silver in chopping boards. Dynamic clauses – such as the requirement in the Biocidal Products Regulation that the risk assessment deploys the best available tools and methods – stimulate the uptake of the latest innovations in risk assessment by producers, manufacturers, traders and and importers who want to apply for approval of new products.

During the application, producers will have to cooperate with the competent **authorities** which receive and review the application. The authority publishes a draft opinion to be commented by **interested parties**, which can be CSOs, other producers and also members of the general public, including consumers. This arrangement provides incentives to third parties to acquire relevant expertise to influence the application process, and to applicants to maximise the robustness of the evidence provided in their risk assessment. While the general procedure applies to both technology cases, the processes can differ in detail. Once interested parties have submitted their comments the authority in charge bases its final decision on the data and evidence submitted. The transparency and openness to public scrutiny creates incentives to provide robust evidence. On a system level, this is expected to assure confidence and trust in the system and technology. However, where long-term impacts of a

product are suspected, the availability of data might be limited, leaving the process open to challenges over the appropriateness of narrowly constructed evidence-based methodologies. Uncertainty over long-term impacts is potentially even more relevant to the nano case than to the GMO case since nanotechnology is the more recent technology with a wider range of applications. Interested parties might flag up uncertainties and knowledge gaps during the public participation procedures. Some parties might have incentives to implicitly address constituencies outside the immediate approval procedures in order to mobilise public support for or against specific products or materials.

Due to its complexity and technicality, the authorisation system arguably receives little attention from most consumers. Trust and system stability, however, depend on a prevailing perception among consumers that the product approval system operates in the public interest. It is therefore of interest to understand how consumers perceive the approval system and to what degree they are aware of participation opportunities. However, since most consumers are not likely to take part in processes that mainly assess technical questions, it is of interest how and whether consumers see the role of CSOs and their engagement in the approval system.

Once a product is authorised to be placed on the market the producers have to provide on-product information or labels on the packaging. At this stage, the most relevant actors are wholesalers and **retailers**, since they decide whether and how to market the product to intermediate and final customers. Retailers in particular will try to anticipate consumer responses to products and the related information. They will try to shape consumer perceptions of products, products groups and materials. In the context of regulatory information and labelling requirements, expectations about consumer responses can have dramatic impacts. The anticipated negative consumer responses to recognisable GMO products had the effect that in most European countries no such products are on the market. Many producers and retailers have adopted no-GMO policies. It is therefore unknown and only assumed how European consumers would respond to such products.

In the end **consumers** will decide whether or not to purchase the products on the market. Consumer choices might be informed by information on the package, which, however, might also be neglected or ignored. Response to information will essentially depend on trust in the information and the product, but also the attitude towards the product. Where a group of products is disliked or distrusted, such as GMO products by many consumers, sceptical consumers will tend to avoid them where they recognise them. Where, on the contrary, a group of products has a positive image, a trustworthy label or well-regarded product information might stimulate demand and allow sellers to increase turnover and profit margins.

Consumer response to products might also depend on trust in the general processes for product authorisation. General trust in turn might depend on the public availability of information or rest on generic trust in the authorities, producers or other mechanisms of checks and balances. Since awareness about GMO or nano products on the market is assumed to be very low, it is questionable whether consumers are aware of authorisation procedures. On the other hand, scepticism or opposition to such products might motivate consumers to keep themselves informed about applications for product approval.

The product information required in the recently developed regulations will in most cases provide merely a substance name with the appendix 'nano' or 'genetically modified' to the consumer. The additional use of logos or labels addressing the nano- or GM- or GM-free properties of a product is controversial due to their alleged potential to confuse or even mislead consumers.

Understanding how information requirements affect the (expected) information and purchasing behaviour of consumers and other actors along the value chain is an important part of regulatory impact assessment that aims beyond risk assessment and includes risk communication. The impact of both the minimum or of more ambitious information arrangements on consumer behaviour awaits to be evaluated. There is a need to understand how consumers perceive relevant products, and how they take up and respond to information. We turn to these questions in the next chapter.

5

Country case studies

It is necessary to keep national differences in mind to understand and adequately analyse the outcomes of the interviews with representatives of national stakeholders. These representatives are partly mirroring the existing national situation in their attitudes and positions, which are the (institutionalised) results of previous discussions and political negotiations with the public or with political pressure groups. The same is relevant when analysing and understanding the differing attitudes of the public in their roles as consumers and/or citizens via focus groups.

Fundamentally speaking, consumers in some countries seem to be more sceptical towards new technologies; others seem to have a more ecological-oriented mindset, and other seem to bother less about both topics. Moreover, consumers might be in general more sceptical towards GMOs in comparison to nano-products.

In the following the five case studies are presented. The analysis for each country consists of a short summary of the national regulatory framework with regard to labelling provisions in both fields. The national market situation focuses on the general market of nanotechnology and biotechnology in the countries and additionally focuses on specific nano-silver and GM soy goods available. This is followed by a brief description of the current public debates. In a fourth section the outcomes of the interviews with national stakeholders are presented for each country apart of Austria. The core element of the country case studies is represented in the fifth section on the focus groups carried out in the five countries.

5.1

Germany

This chapter provides an overview of the results of the empirical work in Germany. It aims to summarize the results of the two case-studies (nano and GMO) in each thematic section.

5.1.1

Regulatory framework

5.1.1.1

GMO

In 1990 the German law on genetic engineering was enacted (*Gentechnikgesetz*) to regulate the use of the technology and for the purpose of risk prevention. The *Gentechnik-sicherheitsverordnung* a related regulation focussing on the safe use of the technology genetic engineering regulates safety require-

ments. These are the use of the technology in genetic-engineering plants and the releases of genetically modified organisms.

Since the entry into force of the Regulation on genetic modified food and feed (Regulation 1829/2003 and Regulation 1830/2003 on tracing and labelling of GM food and feed) the European approach is applied in Germany.

On 1st April 2008 the German Law on the Execution of Genetic Engineering (EG-Gentechnik-Durchführungsgesetz) was amended to allow for a GMO-free label ("Ohne-Gentechnik"). The requirements for the label are extended in comparison to the European labelling laws. It is not allowed to label foodstuffs accordingly which are containing adventitious or technically unavoidable traces to the amount of 0.9%. There are special requirements for meat from animals which was fed with GM feed. The periods between the GM feeding and the slaughtering are varying from 12 month (cattle) to 6 weeks (eggs from poultry).

5.1.1.2

Nano

Currently there are no German laws regulating products containing nanomaterials or regulating nanotechnology. Although some European laws are enacted, they are currently not applicable. The NanoKommission the commission of the German Government was enacted in 2006 to promote the safe use of nanotechnology and to work on chances and risks issues in collaboration with stakeholders. The final report of the commission which was disseminated in 2008 states *principles regarding the responsible use of nanotechnology*. These principles are aiming at the industrial actors. The principles should promote transparency, an open dialogue and good information and risk management practices along the product chain to the consumer (NanoKommission 2008, 55). The German industry is encouraged to establish voluntary agreements based on these principles to manage the use of nanoparticles in the manufacturing process and set up guidelines. By the beginning of 2011 the NanoKommission concluded its work in a report (NanoKommission 2011), whereas the commission supports the application of the precautionary principle. In summary, the questions concerning the labelling of products were discussed controversially (NanoKommission 2011, 47). This situation was also reflected in the discussions about a product register open to the general public (NanoKommission 2011, 46). The industry supported a product register for the use of the administration, whereas a general nano product register was rejected, due to the fact that different regulations already foresee such registrations. In contrary, the environmental and consumer NGOs criticised that such a register should also promote the freedom of choice of consumers. A consensus was achieved that the administration should have a sort of register for the purpose of control and monitoring. The German Government adopted the "Aktionsplan Nanotechnologie 2015" an action plan which should further pro-

mote research on nanotechnology and a dialogue with citizens (BMBF 2010). Here, labelling requirement should not apply to nano products per se. The Government merely focuses on the information about nanomaterials in product, rather than labelling the product, because this could be perceived as a warning (BMBF 2010, 39). Nevertheless, on case by case basis a nano product labelling could be appropriate and necessary.

In 2004, the company BASF developed the *BASF-code of conduct on Nanotechnology*, which applies only to the company itself. The code of conduct shall ensure the safe and responsible production of nanomaterials, as well as, establishing a transparent and open communication strategy. The underlying principles are health and environmental safety, transparency and a constructive and open debate. Therefore, only safe products shall be placed on the market and handling as well as disposal information shall be available to consumers and partners. New information shall be instantly disseminated (BASF 2009). The BASF codex is linked to the Responsible Care Initiative from the International Council of Chemical Association (ICCA 2006).

CENARIOS is a voluntary certification which involves a risk management and monitoring system. It was developed in 2008 from the Innovationsgesellschaft mbH and TUEV-SUED, a private-sector regulatory body with the business objective of protecting human health, the environment and property against the adverse effects of technology. *CENARIOS* is a complex and long-term certification which is deemed to be actualised on regularly basis. It helps to guarantee the product safety and occupational safety. Today, just one company began the certification process (Fiedeler Nentwich et. al. 2010, 4).



Figure 12: Hohensteiner quality seal on nanotechnology

In Germany there are currently two voluntary labels. One is the *Hohensteiner Qualitätslabel für Nanotechnologie* a quality seal for nanotechnology in textiles from the Hohensteiner Institutes and Nanomat a competence network for materials related to nanotechnology. The seal shall minimize the extensive use of nanotechnology for commercial use since there is no consistent definition of nanomaterials available. Today, 4 products are marketed with the seal (Fiedeler Nentwich et. al., 2010, 4). Another quality seal is „Nano Inside“ from the industrial association forumnano which aims at the same goal as the Hohensteiner quality seal. One basic criteria to gain access to the seal is that a product contains a feature based on nanotechnology and that the company marketing the product commits to meet the requirements in the “Responsible Nano Code” a code of conduct set up in 2006 and finalised in 2008 by the Royal Society, Insight Invest and Nanotechnology Industries Association in the United Kingdom. Today, one product is marketed with the seal.



Figure 13: Nano inside label from forumnano

In summary, the Germany regulatory framework concerning nano products is currently based on voluntary agreements. The regulatory needs should be implemented on European level. In general, Germany considers the precautionary principle applicable for nano products, but product information for the general public are discussed controversially. The precautionary principle should be applied by introducing a product register for administrative use.

5.1.2

Market situations

5.1.2.1

GMO

On the German market there are just a few consumer products that are labelled and therefore are containing GMOs above the threshold of 0.9%. These are import products from the USA or from Asian countries (e.g. the chocolate bar "Butterfinger"⁵⁵ or edible oil) (Greenpeace 2010 and 2011). In 2006, the Food and Veterinary Office of the EU evaluated the German official control system concerning GMOs in food or feed (DG SANCO 2006). The final report states that there is practically no GM food produced, but approximately 90% of compound feed is subject to labelling as containing GMOs.

Despite the fact, that just a few products are labelled according to the legal requirements every 4th soy-related product in Germany contains GM soy as soybean oil or soya lecithin below the threshold of 0.9%. This data is based on a survey from 2009 where the official control of foodstuffs authorities of

⁵⁵ <http://www.transgen.de/lebensmittel/produkte/>

13 "Länder" (German regions) where analysed.⁵⁶ In these controls just very few labelling infringement cases were detected.

According to the organisation which is in charge to certify products labelled "GMO-free" ("Ohne Gentechnik"), there is a trend towards the use of such labels in Germany (VLOG 2010). The product brands using the label are for example "Landliebe" (Campina). Today there are 51 products of 17 producers on the market which are marketed "GMO-free" (Verbraucherzentrale Hamburg 2010).⁵⁷

Since every 4th soy-related product contains GM soy to a minimal amount and the "GMO-free" label effectively provides no information about the use of GM soy feed for cattle. The amount of not perceived GM soy-related products on the German market is still relatively high.

5.1.2.2

Nano

In Germany approximately 800 companies apply nanotechnology; thereof 80% are SMEs (VCI 2010, 2). Besides the United States of America, Japan and South Korea, Germany is one of the leading countries in nanotechnology research and industrial realisation. A production of 8.000 kg silver was estimated in 2007. For 2015 it is estimated that the use will rise to 8.800 kg (UBA 2008, 28). Approximately 1.100 kg silver is used in sectors where nano-silver plays a role, too.

The German NGO BUND (Friends of Earth Germany) stated that Germany has one of the highest presences of nano products worldwide in one of their studies (BUND 2009, 3). The NGO designed an online database which includes 200 products related to "nano claims" in general available on the German market.⁵⁸ Currently there are 37 products listed containing nanosilver. As every inventory on nano products the German list is not exhaustive. The BUND database is still under construction.

There are two nano-labels in Germany, the "Hohensteiner Qualitätssiegel" and the "nano inside" label. According to the specific websites, four textile products are currently labelled with the "Hohensteiner Qualitätssiegel" and only one nano coating product for glass is labelled with "nano inside".

⁵⁶ See <http://www.transgen.de/lebensmittel/ueberwachung/688.doku.html>

⁵⁷ for a detailed list, see:

<http://www.vzh.de/ernaehrung/35807/Gentechnikliste%20Endversion%20ohne%20VZBV.pdf>.

⁵⁸ http://www.bund.net/bundnet/themen_und_projekte/nanotechnologie/nanoproduktdatenbank/

A resilient analysis about the use of nano-silver in consumer products in Germany is not feasible since the analysis is currently based on “nano claims” and voluntary labelling. Still, most of nano-related products are not labelled.

5.1.3

Public debates

5.1.3.1

GMO

Due to the Eurobarometer survey (2010a) 65% of the German citizens already heard of GM food, but have in general a negative attitude towards it. However, in the recent German media there are no major discussions about GM food or genetic engineering in general. The debate is more or less held by specific groups involved in the issue (e.g. green NGOs, ecological farmers).

A minor “scandal” was debated because McDonalds did not inform the customers that the feed of the cattle used for the meat is fed with GM feed (which is actually in conformity with EU law requirements). According to the NGO foodwatch a petition campaign mobilized 72.000 citizens (foodwatch 2010). Still, there are recurring protest campaigns on the use of genetic engineering, GM crops and GM food and feed in Germany. The last campaign in January 2011 attracted approximately 15.000 people (according to police reports) in the capital during the International Green Week in Berlin (FAZ 2011). The campaign served to protest against genetic engineering, intensive animal husbandry and dumping-exports.

In summary, the current discussion is focussing on the necessity of GM feed and its cultivation in Germany.

5.1.3.2

Nano

A major participation initiative of the German government was carried out on the topic nanotechnology. The “Nanodialog” which was enacted by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit – BMU) aimed at the promotion of an early and transparent dialogue between decision makers and stakeholders in Germany. For these purposes the NanoKommission – a commission comprised of different stakeholder groups and ministries – was established. Three working groups were installed to address

1. opportunities for the environment and health,
2. risks and related research questions, and to develop
3. guidelines for a responsible handling of nanomaterials (BMU 2008, 2).

The Dialogue resulted in the recent Aktionsplan Nanotechnologie 2015 (BMBF 2010), an action plan which is defining the next steps of initiatives towards

nanotechnology. According to the action plan informing the public through specialised media is a key issue (BMBF 2010, 7 and 44). The existing information initiatives like the nanoTruck-initiative⁵⁹ of the German Federal Ministry of Education and Research (Bundesministerium für Bildung und Forschung - BMBF), as well as online information resources⁶⁰ should, as well as dialogue initiatives, be intensified. However, to date there is little knowledge in the German population about nanotechnology and with regard to products containing nanomaterials. The action plan states that a general mandatory labelling of nano products is not reasonable, because this could be misinterpreted as a warning and the labelling as "nano product" is of no information value. Instead, the pros and cons of nanotechnology application should be communicated (BMBF 2010, 39). In an interview with the chairman of the Nano-Kommission – Wolf-Michael Catenhusen – he stated that the NanoDialog-process should have been more inclusive, by referring to Austria, Switzerland and the UK. The German strategy on nanotechnology was merely decided by the ministries, whereas the civil society dialogue took place more in a parallel process (Technology Review 2011).

In parallel, the German Federal Institute for Risk Assessment (Bundesinstitut für Risikobewertung - BfR) the Federal Environment Agency (Umweltbundesamt – UBA) and the (Bundesanstalt für Arbeitsschutz und Arbeitsmedizin – BAuA) defined research strategies concerning the assessment of environmental and health risks and the opportunities of nanomaterials (BMU 2007). Especially the BfR is conducting research on risk communication with consumers. A recent study which analysed the content of online fora and weblogs states that there is in general a high acceptance towards nanotechnology in the German population. However, the considerations on benefits of first generation nano products are evaluated negatively by consumers using online media. Moreover, discussion about nano in cosmetics and food is a rather new (BfR 2010, 9). The study assumed that these discussions might be indicating future conflict potentials when the dissemination of nano products on the markets is increasing.

Two scandals related to nanotechnology were reported in the German media. The first occurred in spring 2006. A food supplement called Neosino was advertised as containing nanomaterials, but in fact did not. It was not the advertisement of containing nanomaterials which attracted the journals, it was the false representation of the product which claimed to contain nanotech-

⁵⁹ The nanoTruck is a mobile exposition about the risks and opportunities of nanotechnology, which started its tour in 2008 for 3 years. By now 270.000 people visited the truck on 340 locations in Germany. http://www.bmbf.de/_dpsearch/highlight/searchresult.php?URL=http://www.bmbf.de/press/2239.php&QUERY=nanotruck

⁶⁰ e.g. www.nanopartikel.info.

nology, but in fact did not (Grobe 2007, 203). A second scandal is more relevant, because it found a greater resonance on the international level. The application of a surface spray marketed under "Magic Nano" caused more than 100 cases of breathing difficulties and pulmonary edema among the customers. The product was taken off the market by the administration. This case led to reaction in the international media (e.g. Washington Post) and the case became a symbol of the risk debate about nanotechnology. Particularly interesting is that the German media did not extensively report about "Magic Nano" and that the product did not contain nanomaterials at all. The latter fact did not find feedback by the international media (Grobe 2007, 204-205).

Two opinions of government institutions were communicated in the German media. The first opinion was submitted by the UBA. The government agency suggested avoiding nanomaterials in products because of the unknown risks in October 2009 (UBA 2009). The second opinion was submitted by the BfR in December 2009, whereas the government institute suggested avoiding the usage of nano silver in consumer products (BfR 2009). Both opinions were reflected and interpreted as warnings in the daily press and television news.

Where the German government institutions are disseminating opinions, the German NGO BUND is directly warning about the use of nano silver in products in a study released in December 2009.

The discussions above have shown that there is just little knowledge of nanotechnology and its application in consumer products in the German population. The discussions on nano silver are more or less expert driven and are reflected by the general society to a little extent. However, a public debate about nanotechnology risks and benefits is slowly developing in Germany and will in the further be fostered by the German Government.

5.1.4

Interviews with stakeholders

5.1.4.1

Nano

Among the five interviewees were 3 NGOs (1 environmental NGO, 2 consumer/health NGOs) and 2 commercial organisations (business and industry).

Several of the questions about risk are considered problematic by the interviewees when it concerns the ranking of risks of different nanomaterials and when the question makes a connection between risks or harm and labelling.

- The ranking of risks of nanomaterials for health and environment is seen as problematic, because this depends on many circumstances, such as application, exposure, type of material, regulation. It is also seen as a matter for experts (questions 5). Moreover, there are still

considerable knowledge gaps to clearly state a ranking. As long as there is no considerable knowledge about risks one might also think taking into account other product groups, for example drugs.

- The questions about upcoming EU legislation were difficult to comment, because those answers are based on a gut feeling. The same applies to the trustworthiness of labelling schemes.
- The question what nano can learn from GMO is not answered in most of the cases. The question seems to be too difficult.

Main concerns/risks and uncertainties relating to nanosilver

Nearly all the interviewees mention the lack of information and the uncertainty concerning impacts to health and the environment with regard to the use of nanomaterials in consumer products as a main concern (e.g. through bio-accumulation and resistances of harmful bacteria through extensive use; killing of useful bacteria). Consumers will be most concerned about products used close to the body. As long as the knowledge about risks is lacking one might also think of other products, for example, drugs.

One commercial organisation does not see special risks in comparison with other biocides. Risk assessment's basic rules do also apply adequately to nanomaterials. Therefore nanomaterials should not be treated differently. Moreover, there are also concerns regarding the commercial exploitation of nanomaterials and administrative burdens for the industry (overregulation). Regulatory options need to be assessed adequately to measure economic impacts as well.

Just a few mentioned the lack of obligatory product information as a concern.

Nanosilver seems to be an adequate example to show the lack of risk assessment and regulation debate in Germany against the background of consumer products. Nevertheless, other nanomaterials seem to be more important for the work of the interviewed organisations since there is a considerable amount of unresolved questions.

Dissemination of information: product information through labelling

The views of interviewees are very different when it comes to evaluate the trustworthiness of current nano labelling. The evaluation of the trustworthiness of nanosilver-specific labelling seems to be problematic, since there is no labelling in place by now. Moreover, the past showed that different labels might be assessed differently (e.g. CE-labels and Bio-labels).

NGOs all disagree that current nano product information would give an informed choice for consumers, since there is currently no considerable nano label or product information in place. However, commercial organisations tend to agree to that statement. Commercial organisations might assume that

the consumer do not care for nano product information by now. The commercial organisations agree that consumers are not interested in nano related product labelling information or do not state an opinion. The NGOs disagree to that statement. Some even stresses that consumers are very interested in nano-related information.

Most of the interviewees state that there is a right to know, therefore, nano should be mentioned on the product. Additionally, some questioned the use of such information alone with regard to the complexity of nanomaterials and the current knowledge in the population. Some argue that at least where risk assessments are lacking due to unresolved questions the consumer needs to know that the product they are buying is at least a nano product.

Most of the interviewees are not satisfied with the current labelling scheme, because there is no labelling scheme (or product register) in place or effective (see cosmetics regulation) which might satisfy. One commercial organisation stresses the problem that nano-specific information has to be clear and explicit and this might be problematic because of the complexity of nanotechnology. Regulation attempts might therefore face difficulties. A NGO stated that there should be more ways to acquire general knowledge about nanomaterials.

Most of the interviewees do not want to be pessimistic or optimistic about upcoming labelling regulation would lead to an informed choice on the side of the consumers. One commercial organisation working in the field of textiles does not comment on that statement because a regulation is in place which seems to fulfil the requirements.

All interviewees do not know a labelling scheme they might implement into the national context.

Perceived role and behaviour of consumers

In general, all interviewees agree on this broad question about a connection between harm and consumer behaviour regarding products, but most of the NGOs stress that the connection should be taken into account carefully. This also applies to the special case of nanosilver products. A connection also stresses the need to think about the responsibilities shifted to consumers. An NGO even stresses that production of knowledge about the consumers' handling of risky products could lead the inadequate perception that risks prevention could be shifted in some sort to consumers. This would be a failure.

However, industrial organisations are referring to the chemicals example, where consumer compliance to product information is crucial to prevent them and the environment from harm.

The views on the importance of knowledge about consumer behaviour therefore vary widely. This implies that the role of information with regard to con-

sumer behaviour in the regulatory process might be unclear and should be different with regard to the different product groups.

Most of the interviewees are disagreeing that routines of consumers are suitable to prevent them from negative impact of products. In general, nano-products need to be safe in order to be sold to consumers on the market.

Regulatory challenges

The government should in first place prevent consumers from harm by allowing the placing of products on the market which are per se safe. Product misuses should be avoided and in order to get knowledge about those potential sources of hazards knowledge about consumer behaviour might be used.

A distinct consideration of the knowledge about consumers purchasing and handling behaviour for the purpose of drafting regulations should be made. Here, different product groups and different ways to inform consumers should be considered, as well as the impact of information obligations on the market. To assess economic impacts of information obligation, first, other regulatory problems should be resolved, for example definition of what is nano or what a nano-product might be.

Public engagement and participation

Most interviewees refer to their own situation and conclude that EU NGOs give adequate consideration to national viewpoints. However, some interviewees who interpret the question in general mention several problems, such as too different viewpoints and conflicting interests. On the other side budgets and personnel shortage leads to the situation that some national organisations abstain from engaging European organisations or participatory procedures on the EU level.

There are different ways to engage the European participation processes and European institution in general take into account national organisations view points. Nevertheless, to participate on EU level resources are needed and not every national organisation is able to do so. The resources are unequally distributed. As one NGO mentioned globally there are just 3 persons working on nano-issues on the side of NGOs.

5.1.4.2

GMO

Among the seven interviewees were: 1 NGO, 2 organic farming organisations, 1 biotech industries organisation, 1 conventional farming organisation (diary), 1 food label organisation (GM-free label).

Questionnaire:

- Questions with relation to risks had to be specified. For the purpose of the interview the term risk meant “potential hazards based on uncer-

tainties". This was the case for the ranking of health and environmental risks of GMOs and the question of risks of GM soy.

- A ranking of GMOs was difficult to make, because of lacking knowledge about hazard potential of GMOs.
- The question what can GMO learn from nano was not answered by most of the interviewees

Main concerns/risks and uncertainties relating to GM soy

Concerns vary widely: unpredictability, uncontrollability, irreversibility, inadequate risk assessment and missing long-term studies, loss of freedom of choice, co-existence problems, fear for contamination of organic crops and possible effects on human and the environment, as well as, GMOs are not benefitting the population, but are used to transform the market, despite that consumers do not want GMOs in products. Moreover, the quality of farming suffers. Farmer would on the long run unlearn the methods of conventional farming. On the other side concerns arise in the industry organisations that authorisation and threshold rules are affecting the freedom of occupation and innovation. Moreover, administrative authorisation is strongly influenced by political considerations.

The request to rank health risks is seen as problematic by most of the interviewees. Rankings are more or less based on the assumption that risks are also resulting of uncertainties. One industrial organisation states that authorized GMOs are safe. The agricultural organisations do not consider health risks as direct problem of GMOs, but on the cultivation practices, these are deriving of spraying techniques or are based on the loss of biodiversity and therefore endangering nutrition sufficiency. Moreover, long term effects like allergies can never be excluded. Half of the interviewees rank GM-soy on first place (herbicides).

The request to rank environmental risks is answered more or less in the same way as the former question about health risks. The industry organisation issues the absence of risks of authorized GMOs. Environmental risks for countries of origin are also mentioned (related to misuse of GMOs; spraying; out crossing; loss of biodiversity) and the problem of the very large scale agriculture (monocultures, loss of biodiversity). Three NGOs are ranking GM-soy (or food and feed) on first place.

Every interviewee is working with GM-soy in some sort (food, feed) and basically as import good. The following risks related to GM-soy are mentioned: loss of freedom of choice, loss of biodiversity and unpredictable long term effects, harm because of pesticide use, herbicide resistance, and unknown health risks of built in genes, danger of cross contamination. Moreover, there are additional costs for organic farmers in those countries because of quality controls (8-10%). The industry organisation states that GM-soy is authorized

and safe. The dairy farmers' organisation stresses the problem of negative publicity of GMO use and the pricing pressure on the market. There is a tension which is also provoked by the labelling practices. The organisation assumes that consumer would likely pay more for non-GMO products if they knew which products are containing or produced from GMOs.

Dissemination of information: product information through labelling

The interviewees had different viewpoint on the question if current product information enables consumers to make informed choices. The industry organisation even stated that the labelling provisions are misleading, whereas the dairy farmers' organisation and the organic farming organisations agreed to this question. Four of Six organisations do not agree that product labelling in general is trustworthy; among them the industry organisation.

With regard to GM labelling regulation half of the interviewees stated that it does not enable consumers to make informed choices. One interviewee agreed to that statement by referring to the German GM-free label. Two interviewees were not sure or did not state an opinion (the labelling organisation and biotechnology industry organisation). In contrast, most of the interviewees disagree to the statement that consumers are not interested in information provided through GM food labelling. The dairy farmers' organisation assumes that consumers would be even more interested if they would know how many products are related to GMOs. The Biotechnology industry organisation was not sure about this statement.

Most of the interviewees disagree, that the current GMO labelling scheme is satisfying. The labelling organisation agrees to the statement by taking into account the German GM-free label which is distributed by them, but they also acknowledge that the label is no substitution for the positive labelling. Therefore, current European labelling scheme is perceived as being not adequate by every interviewee. A positive labelling would be clear and explicit. Moreover, both positive and negative labelling should also take into account the production process. The biotechnology industry organisation even goes further and states that misleading of consumers would stop if also drugs etc. would have to be labelled.

Four of the interviewees are not satisfied with the national GMO scheme whereas the interviewee took into account the GM-free label. The biotechnology organisation states that consumers are misled, since the production process is not taken into account properly. GM-free labelling is perceived being in general just a good start but it has to be developed further. However, two organisations are satisfied. One stated that the GM-free label they are distributing fills the gaps of EU regulation as far as possible. Nevertheless, all interviewees stated that the current labelling should be developed further. Four organisations state that a positive labelling would be better. 5 state that

the production process should also be taken into account. One organisation issued comprehensibility problems because of too many labels on the market. One organic farming organisation mentions that consumers should be enabled to exercise their purchasing power.

Perceived role and behaviour of consumers

Five of six interviewees do not think that the current everyday routines of consumers are sufficient to prevent harm from GMOs especially to the environment. In contrast, the biotechnology industry organisation tends to agree to the statement. One organisation notices that consumers need more information.

Five of six organisations see a link between harm to health or the environment and the consumer's purchasing behaviour regarding GM-soy products. They assume that consumers would not buy and therefore support GMOs. Whereas most of the interviewees (with the exception of the biotechnology organisation) state a link to environmental effects three interviewees also state potential health effects due to uncertainty according to missing long-term studies. Four interviewees refer to the right to know of consumers. In contrast the biotechnology organisation does not see a link. Consumer behaviour is irrelevant because products on the market are safe.

Regulatory challenges

The statement that it would be necessary to know more about consumer perceptions to support the regulatory process is both agreed and disagreed (3 vs. 3).

Public engagement and participation

All interviewees agree that EU stakeholders give appropriate consideration to viewpoints of national counterparts. Two organisations state that they are opinion leaders because of different reasons. One interviewee noticed that the conventional food lobbies are more powerful than the organic sector. The powers are quite unbalanced and this should be changed.

The reactions to the statement that national stakeholders have adequate opportunity to engage in participatory procedures at EU level were very mixed. Two organisations did have no opinion, because of lacking knowledge or no ambition to engage at European level. Two interviewees agree on the statement, because everyone has the possibilities to participate. Again, two NGO mentions difficulties based on the spare resources of their organisations in contrary to the resources of the industry lobbies. The biotechnology industry organisation refers to conflicts between them and their European counterpart and disagrees.

5.1.5

Focus groups

The following chapter provides an overview of the results of the focus groups with consumers in Germany. It aims to summarize the results of the two case-studies (nano and GMO) and to compare these results. In every section both the findings of the focus groups are compared.

First of all the research approach for Germany is presented. Here the participants of the focus groups are compared to the average distribution in Germany with regard to gender, age and the level of education. Second, the perception and knowledge of the technologies and products are compared between the both case studies. Third, the most important purchasing criteria compared to new technology products are issued and compared. Fourth, the findings relating to consumer Information is presented and compared along the three inputs: labels, product information and websites. Fifth, the participants' discussions about the responsibilities and the role of actors are discussed and compared.

Six focus groups were carried out between July and August 2011 in Germany. For each technology 3 focus groups were hold and for each technology 17 participants attended the discussions. Up to 7 persons attended the single focus groups.

5.1.5.1

Participants

In general, the participants of both focus groups series had a heterogeneous background in terms of socio-demographics and profession. The focus groups are not representative with regard to age and education, but to certain extent representative with regard to gender. The data underlying the average distribution analysis for Germany is based on the German microcensus. The microcensus is the annual official collection of representative statistics on the population and the labour market in Germany. The data of 2008 was used.

The following tables show the gender, age and education distribution of the focus groups compared to the German population.

Gender distribution (2008)		
	<i>Male</i>	<i>Female</i>
Population %	48,5	51,5
Nano sample in %	52,9	47,1
GMO sample in %	35,3	64,7
All focus groups in %	44,1	55,9

With regard to the distribution of gender, the GMO focus groups were more attracted by women whereas the participants of the nano focus groups were most attended by men.

In comparison with the whole of participants the women's views were slightly stronger represented than the men's views.

Age distribution (2008)					
	<20	20-40	40-60	60-80	>80
Population in %	19,0	24,6	30,8	20,6	5,0
Nano sample %	0,0	29,4	58,8	11,8	0,0
GMO sample in %	0,0	70,6	23,5	5,9	0,0
All focus groups in %	0,0	50,0	41,2	8,8	0,0

The focus groups missed out the point of views of person under 20 and over 80 years. In the GMO sample the views of 20-40 year old persons are clearly dominating whereas the views of 40-60 years old persons are slightly under-represented. For the nano sample the situation is the opposite. For both technologies the views of the over 60 years old persons are clearly underrepresented.

In comparison to the whole of attendants the views of 20-60 years old persons are clearly overrepresented.

Education distribution (2008)		
	University	Other
Population in % (of persons over 15 years)	20,0	80,0
Nano sample %	47,1	52,9
GMO sample in %	59,9	47,1
All focus groups in %	50,0	50,0

With regard to the different levels of education in Germany the focus groups were not representative, as well. For both focus groups series the respondents with higher education degrees are represented by approximately half of the attendants. Just one person in a GMO focus group was unemployed and this triggered some aspects, which will be reflected in the following.

During the GMO discussion it appeared that there were salient differences of opinion between persons with different degrees of sympathy for organic food. This happened in all GMO groups but it was not a planned contrast.

In the nano discussions there were also differences between persons which were concerned to certain extend with the impact of products along their life cycle and persons not referring to those indirect product impacts.

5.1.5.2

Response to the focus groups

A similar focus group guideline was applied in both focus groups series. It was an appropriate instrument to get information about the practices and the beliefs of the participants. It should be noted, however, that the number of questions was large and that the questions varied in the level of detail. Because the participants were not aware of this, the facilitator had to be flexible in specifying the focus of the discussion.

The most stimulating parts of the guideline were the questions that enable the participants to tell each other something about their daily practices, as well as, questions accompanied by a product that they inspected thoroughly.

In the case of GM, the participants were able to answer most of the questions concerning possible impacts of the technology or GM soy. For the case of nanotechnology, nano-silver and related products most of the participants were unaware of possible impacts. The participants then discussed the possibilities thoroughly and came to reasonable conclusions, by reflecting the advantages and disadvantages of those products.

There were several questions that assume more familiarity of the participants with nano or GMO products than they had. As a result, there was not much response to questions about differences between a nano chopping board or GMO margarine and the conventional product, and about a friend who wants to buy or avoid the new technology product.

Afterwards, nearly all focus groups participants were satisfied with the discussions. Some issued that more knowledge about those products and the technologies is needed to better respond to the questions asked. Nevertheless, nearly all participants enjoyed to discuss the application of such new technologies in products and to have a forum for exchange among consumers, which was regarded as a possibility to make up their minds about the issues discussed.

5.1.5.3

Perception and knowledge of the technologies and products

In both focus groups series the participants were rather unfamiliar with the technological issues and had no experience with the new technologies' prod-

ucts on the market: They never considered buying those products intentionally.

Although, perception and knowledge of the participants was gathered with special questions at the beginning of the focus groups, additional response was obtained with the following questions on purchasing criteria, as well as, on consumer information.

Genetic engineering and its products

The first reactions of a considerable amount of participants in Germany on genetic engineering and related products were negative because those participants do not appreciate genetic modifications at all. They also repeated this stance along the focus groups discussions.

“I simply reject these kinds of modifications”

Those participants stated also that GMOs for food and feed use are only benefitting the industry, but did not refer to other applications for example for medicinal purposes. They were also very angry, because they questioned whether there will be a possibility to avoid those products in the future.

“It advantages the industries. There is also Nestlé. I think in future we will not be able to avoid GMOs.”

“Nobody knows if it is harmful, but nobody knows what happens in the future. The yields are higher, but it is just for the money and not for the human welfare”

Nevertheless, some participants were also aware of negative or sceptical media coverage and questioned if there weren't any advantages for the society as a whole.

“The media coverage is very sceptical. It has a negative publicity”

“I am not sure if GMOs are negative per se according to the media coverage. Perhaps there might be advantages”

Some fewer participants had a neutral stance towards the technology and related products. Those were more willing to discuss their advantages and disadvantages. Especially with a view on prices and persons who are not in the position to afford expensive organic products some sceptical participants were willing to understand that the GM margarine could be of interest for those persons.

The participants named some application of genetic engineering, mostly based on assumptions, since they were actually not sure about the real amount of application possibilities. Among those applications were plants and feed, maize, potatoes, tomatoes, apples etc.

With disadvantages of GM soy the participants referred to uncertainties relating to health, animal health, social and environmental effects. Especially, pos-

sible negative health impacts resulting of consumption of GMOs in food were issued, but the notion was brought up in the beginning and not further discussed in the focus groups. More prominent impacts were relating to environmental and social aspects of cultivation. They stated among other that for the exploitation of the technology tropical rain forests would be chopped down and croplands would be exhausted. Moreover, traditional soy varieties are repressed. Some fewer participants also heard that animals fed with GMOs would get infertile.

“I have a fear because it could harm humans. There are no or just a few studies and I read about it and saw it on television. I was really shocked about this, because it wasn’t reported that it could be harmful”

In general they were well aware that studies would be lacking. Moreover, nobody would certainly know if they already got in contact with GMOs since most of the participants assumed that labelling provisions would be lacking, too.

“The media coverage has a sceptical view on the issue, but nobody has negative experiences. There is uncertainty. Nobody knows if he was already in contact with GMOs. I saw a label stating “without GMOs”, but until now I did not see a product information which indicated, that the product actually contained GMOs”

“GMOs are in consumer products and stupid thing is that they need not to be labelled. Looking at organic foods, these foods require not to have technically altered ingredients”

Some participants stated advantages of the genetic modification and that it would improve herbicide resistances of the soy plant. They also assumed that the modification could lead to higher yields or cheaper products, but were in general not sure about it.

Nearly all participants assumed that there are no GM-margarines on the market. However, some participants already saw the label “*produced without GMOs*” and that is why they actually weren’t sure about their assumption. Anyway, the question asked in the focus groups produced uncertainty about the existence of GM-margarine on the market, but in most of the participants’ minds this question hardly was raised before asked in the focus groups.

“I was thinking that there is no GM soy margarine on the German market, but keeping in mind that products are labelled not containing GMOs, I am not sure, now”

“Surely existent but I do not buy this”

“I don’t want GMO soy margarine on my bread.”

Different responses were made to this question, but most of the participants were not really aware of the product and the question produced some bewilderment, surprise and counter-questions.

Nanotechnology and its products

The introduction to the term nanotechnology was not enough to explain nanotechnology or nanomaterials to the participants, because most of them were not familiar with this topic.

Nevertheless, at least after a short discussion among the participants the term “*nano*” generated some associations with products, such as medical devices, food supplements, cosmetics, textiles, electronic devices and other forms of applications, such as coatings for glasses and through paints and lacquer, as well as, improving in some sort the production process. Moreover, the term “*nano*” was mostly assumed to be an advertising trigger, because it makes common products perceived being modern. In general, nano had a positive connotation.

“There are new deodorants with silver molecules etc. But just the term nanosilver describes tiny silver particles. I think it is the same as with nano ipod: Put nano before the product name and it sounds good. Can be sold!”

The term “nano-silver” did not trigger much response. Anyway, some few participants could name positive and useful forms of applications of nano-silver in different product groups, for example medical devices, coatings for canteen kitchens, paints or food packaging, etc.

“I never heard of nanosilver before. Is it a term? Nano-silver?”

“Given the situation that everybody has such a nano-silver chopping board and cleans it and disposes it, the nano-silver is released to the environment in a much higher degree and are harming and minimizing bacteria populations. There could be an unbalance in the eco system. But speaking for me, I see a point in this nano-silver for food packaging. If food is more durable this would prevent me from going to the super market every day.”

Besides the generally more positive stance towards products with nano-silver in the perception of some participants fears prevailed because of uncertainties about possible effects.

“Is nano-silver transporting something? When it is in your body does the security gate at the airport give the alarm, then?”

Few respondents were to a certain extent aware that nanomaterials have the ability to enter the body. Moreover, through the discussions some participants questioned the retrievability of particles once released to the environment.

“Nano is not retrievable anymore once released to the nature lifecycle. It is so small, who can remove it? It is not possible. And that is the problem because nobody knows what happens. Where does it accumulate in the body? And we are placing tonnes of it every year on the market.”

The question “*What comes to your mind if you think about nano-silver chopping boards?*” triggered different results. Some of the participants referred to

specific nano-silver application in products already mentioned above by referring to the antibacterial function (e.g. textiles, deodorants, medicinal devices). Most of the participants were not aware of nano-silver chopping boards on the market

Comparison

In comparison the GMO the term “nano” triggered a more positive image. GMOs were regarded to be negative, whereas there would mostly be benefits for global firms, but not for the society as a whole. GM was somewhat more familiar than nanotechnology with regard to the effects on the environment and rural farming in the countries where GMOs are cultivated. Nano was perceived being more modern, allowing conventional products to be more efficient.

Some participants knew at least a little bit about nanotechnology but it was difficult to imagine the pros and cons of nanomaterials in general and especially of nano-silver used in the chopping board. They focused on those aspects of the topic they were more familiar with, in particular, the idea that tiny pieces of a chopping board may end up in the food and the supposed anti-bacterial effects. Moreover, some participants could imagine the possible problems that nano silver could have on the environment. The advantages of a nanosilver coating on a chopping board did not compensate the unknown risks of this kind of nanotechnology application. However, there was not much response to several of the questions relating to the advantages and disadvantages since knowledge about nanotechnology is very limited.

For genetic engineering most participants already had a specific position. They were well aware about possible application and their impacts on their lives. Most of the participants were not aware about GMO products on the market and the question asking them about their knowledge about GM margarine had very strong response. However, few participants were not really concerned about this question.

Nearly all participants were not aware about the widespread of GMOs or nanomaterials on the consumer product market and were assuming not being in contact with such products.

5.1.5.4

Purchasing criteria

In both focus groups series the importance of the products was rather low.

Margarine had different significances for the participants. Some are especially using margarine, some are less intentionally using margarine but issued that margarine is a vegetable fat which might be existent everywhere and would also be eaten on daily basis as, for example, in French fries or on bought sandwiches etc. Anyway, most of the participants do not intentionally buy

margarine and stated that they would prefer butter or other toppings instead of margarine for health or taste reasons. Anyway, for baking or other cooking purposes margarine seemed to have more importance.

The chopping board is of little importance to most of the participants but it is as well a standard product in a kitchen and they would miss it if it was not available but could also do without it. Most of the participants had a chopping board which was in use for several years. However, some did not thought of the importance of chopping boards for their daily lives before and considered it to be more important for those people which have more interest in cooking.

Conventional margarine and GM-margarine

Most of the participants stated price aspects as a criterion followed by taste, quality and healthy, presentation and advertisement for the product. A few participants said that they would look at ingredients. They try to avoid some ingredients because of diabetes or digestion inabilities or because they have children. Nearly no participant was taking into account production processes.

When asking about the differences between margarine and GMO margarine the participants were hesitant because of insufficient knowledge about the issue.

“I don’t know real differences between GM and non-GM margarine. There is still lacking knowledge. Anyway, manipulation sounds negative because it is not natural and therefore might lead to fears.”

They also stated that information about GMOs is still not sufficient and, basically everybody should know what they eat.

Most of the participants stated that there will be no special differences between GMO and non-GMO margarine according to taste or look. Anyway, GM soy margarine could be cheaper. Some participant stated that the product, nevertheless, could perhaps be healthier or not unhealthy since the standards in Europe are very high in comparison to the standards in for example the US.

“Yes, margarine made from GM soy could be cheaper. This would be a point for me to buy it.”

“Since such products are not prohibited I assume that they will not be such a threat compared to the US or China. I feel save in Europe.”

Moreover, indirect differences were stated according to the production process. Here the participants stated that it would benefit the industry, would have negative impacts on nature and the rural farmers. Some more emotional connotations were that the product is unnatural and would therefore not be tasty.

“Traditional products are natural. I don’t know if I would buy a GMO product if I knew that they are safe. I think I would buy the natural product.”

“In my imagination GM products appear to be flavourless. Something was taken out of the product which was negative. That means that the GM product should be better, but I would not like it. For example, melons without kernels appear to be flavourless, but the product might be better because you don’t need to spit them out.”

Most of the participants would try to avoid GM margarine. Some fewer participants would not care about GMOs in margarine and some even would give GM margarine a try.

Conventional chopping boards and nano-silver chopping boards

Most of the participants referred to functionality (size, material) as the first criterion which should be fulfilled by a chopping board, as well as, style (colour, shape) and price (*“Its just a chopping board”*). Most of the participants did not refer to health as a criterion for conventional chopping boards but were more likely to refer to it by thinking of the nano-silver chopping board example.

With a few exceptions, the participants had almost no clear associations with nano-silver chopping boards since nobody had seen the product or commercials about it. Some referred to the question before and tried to imagine the advantages of a nano-silver chopping boards, for example smell resistance, antibacterial effect or less water and chemicals for cleaning. Some were not sure about the price differences.

“If nanosilver is widely used in products I assume that it is cheaper then we think. It has a definite advantage because plastic chopping boards can be coated and I could use it for camping without washing it.”

“I assume that you don’t need so much water or chemicals to clean the board.”

A considerable amount of persons did question the usefulness an antibacterial effect to a chopping board and also stated concerns with regard to the development of allergies in antibacterial surroundings. Some of them also assumed that it might only benefit the producers.

“It sounds dubious. I wouldn’t buy it. I would buy a board made of glass which does not smell as well. I think it is costly and it seems to be a profitable business model for the industry.”

“I assume that the producers would communicate and label their products to influence prices. It is a trend. Nano-silver everywhere!”

In a wider sense concerns about health or environmental effects were issued by a few participants.

“Nanosilver in textiles is causing concerns in me. Textiles are washed and the particles are likely to get into the cycle of nature. It goes along water treatment facilities to perhaps the North Sea and when I eat the North Sea fish it comes back to me. Textiles are subject to wear. Instinctively I have concerns. Chopping boards are also subject to wear because of the cutting with a knife. I could eat these particles on my bread.”

Comparison

In both cases the participants had no experience with the focal new technology products on the market, nor did they know about others' experiences. In both cases the conventional version of the products was of relatively low importance. However, some were keen about their margarine or chopping boards.

The new technology version of the products was not rejected in general. It was suggested that the nano-silver chopping board might be interesting for a niche market of persons who are extremely concerned about hygiene or in canteen kitchens. The GM margarine was sold as a discount brand whose buyers tend to be unaware of the ingredients and have to look more on the prices than, for example, organic consumers. Nevertheless, some participants were clearly rejecting the GM margarine, because they were pro-organic. For the nano-silver chopping board some participants were willing to consider health and environmental effects as criteria which were not brought up with the conventional product.

5.1.5.5

Consumer Information

The questions about consumer information were discussed along a product example which was distributed beforehand. This part of the focus groups led to higher response and discussions.

Labels: GM-free label and nano-product label

Nearly all of the participants stated that they had not seen this specific **GM-free label** before but they assume that they already had seen a similar label. While they could not refer to a concrete product example, some assumed to have seen this label in organic markets (e.g. Allnatura). Some refer to the organic products label (or bio-label) which is also a similar label for products assumed to be produced without genetic engineering.

The label told them that the product was produced without genetic engineering. For most this implied that it is healthier and likely more expensive as compared to other products and that product produced with GMOs are not.

“The first idea which came into my mind was: This product is too costly.”

However, a few participants were not sure if the label was reliable since certifying standards and the organisation in charge was not known and not indicated on the product package.

“It only suggests that it is healthier, but I wouldn’t really know it”

Therefore, some of the participants would be influenced by such a label, some would not, because they stated the label seems to have only a marketing effect without giving further background information about the label or they did not have knowledge about GMOs at all. Some even tend to distrust the label.

“If I saw such a label on a product besides other products in the shelf, I would most likely choose this product. As long as I don’t know the pros and cons of genetic engineering I would try to avoid products which could be produced with GMOs”

“This would not influence anything since I do not know anything about GMOs”

A general tendency with regard to the actual influence of such a label alone could not be perceived. Some would also want to know the price or also if it tasted better or not.

“I would have to know the price! Besides the information on the label this would also influence my purchase decision.”

“I would buy a product produced with genetic engineering, if the product tasted better.”

In general, the label alone would not be enough to influence their purchasing decision. It would be necessary to have more information about the background of genetic engineering and products which are already containing GMOs, as well as, the label itself.

For nearly all of the participants the **nano label** alone was also not enough to influence their purchasing decision. They would like to know more about nanotechnology, nanomaterial used, effects and the institution certifying the product.

“I need to understand the information on the label. By now it doesn’t make any sense.” “I can’t do anything with that information” “I am not convinced. It would not influence my purchasing decision.”

“First, I would need more information about the logo and then I would decide to buy it or not.”

On the other side, the term “*nano*” seemed to have a positive connotation for some consumers.

“I assume that my husband would buy this. It would be totally awesome for him because it has something technically.”

In some cases the product is conceived suspiciously and would be avoided.

“I would simply not buy the product.”

The negative reaction of some participants is based on bad experiences with product information in the past. They stated that product information lacks in general and would be more or less useless and unreliable.

“I am confronted with many products in shops, the internet and wherever. There are many influences and as consumer I often feel kidded because of product information which is nonsense, simply false or misleading. Product information which does not give added value and that is why I have a negative stance towards such information.”

In comparison both labels seemed generally not being enough to be useful for purchasing decisions of the participants. However, they stated that labels on the front of the package are useful as with the organic products label but most of the participants would need more background information to feel proficient enough to interpret the label. This requires on both cases the background of the label (e.g. certifying organisation and requirements), as well as, reasons for a label based on knowledge about the technology in general and its application in products.

More detailed product information

Nearly all of the participants did not see the product information **“contains genetically modified soy”** before and were surprised since they assumed that there are no products labelled containing GMOs on the German market. All of the participants did not question that product labelled in this manner contained GMOs. The product information therefore seems to be clear and explicit on that point in comparison to the label before.

For a few participants the background of GMOs and the labelling provisions were still not known, the information was still not sufficient and was perceived as useless as the label presented before.

“This seems to tell me that the soy bean or the plant was genetically modified before production, but I don’t now why and what the modification caused.”

For other participants seeing such product information would give them the impulse to inform themselves about the legal background.

“The first time I would see this product information I would inform myself if this is mandatory product information according to EU-law or the like. But I think also that nobody would give such information voluntarily because it has a negative reputation.”

However, Most of the participants reported that they would not notice this information since they are not really looking at ingredients lists of margarines: the product in general is of low importance and cheap or the typo is in gen-

eral too small to be read by older persons. This was also assumed for other purchasers.

“The typo is too small and I would not notice this information without my glasses.”

“I do not read the ingredients list of margarine. Eventually I do it at breakfast when I do not have any newspaper to read. I would be very angry to read it at that point”

“I am a vegetarian and therefore I am reading ingredients lists very often, but I did not read the ingredients list of margarine before.”

If most of the participants knew that the product contained GMOs they would not buy it but there are also exceptions to that rule.

“Not speaking for me, but I think there is also the price criterion to be considered. I think there are consumers which would buy it if it is really cheap.”

“I don’t care about GMOs. I buy products which are tasty! But I think this would be more influencing my decision than the label before.”

Moreover, the product information seemed to have more influencing potential in general.

For some persons the **nano product information** example was perceived as being more informative as the label presented before. Now they understand that the antibacterial effect is achieved through nanosilver.

“This information is OK. I am able to imagine what it is. It seems to have a distinctive feature which makes this chopping board made of plastic better than others.”

For some more sceptical participants the information is still not enough because they do not know what nanotechnology is and what it implies. They wanted to know more about the possible positive and negative effects of nanotechnology in general to feel sure enough to interpret such information.

“Antibacterial sounds good and healthy to me, but I still don’t know about other negative health effects the coating might cause. Naturally this is not revealed on the product. I am still sceptical and would recommend others to be, too.”

On the other side some participants would not care for that information since they are just buying a chopping board.

“It is too much information. Frankly speaking, I am just buying a chopping board. I don’t care what is written on it, it’s not like I would buy a cell phone or something like that. It is nothing of importance. It has to be cheap and probably dishwasher-safe. I would take too long to choose. I would look at prices in the shop and that’s it.”

The antibacterial effect seemed to be interesting and could become a new and relevant criterion to buy the nano-silver chopping board. On the other side some participants questioned why somebody would need to have an antibacterial chopping board, since the hand which prepares the dishes is not, as well as the knife. Moreover, they stated that an antibacterial surrounding might also be negative to form antibodies and could lead to a rise of allergies.

“Antibacterial coating is not an argument to buy the product. It is sufficient to clean the product traditionally. I don’t want to live in a world where there are no bacteria and I would need to avoid any dirty place to not getting sick.”

Not speaking about the actual decisions participants would make the product information seemed to be more useful than the label alone, since the respondents needed to know more about the function of nano-silver to take it up as a criterion for the purchase decision. Still some few participants did not feel informed enough about nanotechnology to assess the possible positive and negative impacts of the use of such a product.

In comparison both product information samples were not known, but conceived being more useful and valuable than the label alone. Whereas some participants already felt informed enough to draw a purchasing decision, some would still not be influenced since they would like to know more about the technology behind the product and its impacts. Those participants were also willing to inform themselves via other sources as, for example, the internet. However, a specific difference can be conceived. For the case of GM product information most participants assumed to be informed enough, whereas for the case of nano information the participants discussed more controversially about the usefulness of such information and the benefits of nano-silver in chopping boards. This mirrored the higher amount of knowledge gaps for the case of nanotechnology as compared to genetic engineering.

Website information

The participants mostly acknowledged that they would make an effort to assess about **GMOs**, GM soy or GM products on a website.

“It is a good possibility to look in the internet for more information”

Still there are scepticisms concerning the intentions of the operators running the website and the usefulness of different kind of information (e.g. general information, more detailed information or information about specific product brands). Especially, few participants were not really interested in information about genetic engineering or related products at all.

With regard to the information presented on the website most persons were surprised about the amount of product groups which could contain GMOs. The participants assume that they are consuming more GMOs than they

thought. Some would even avoid to be frustrated by ignoring the information of such websites.

"... I would look at the information, because it is interesting to know, but I will see which products are affected and I would have to change. So I am better off if I do not look at the information presented here and I buy like I did before."

"After reading through the webpage there is a risk that you will have to change: "Ok, now I will have to plant my own vegetables!" If you want to make it right you will have to admit that you mustn't eat anything anymore. This is really frustrating"

Most respondents stated that the only case they would follow a link on a product to further detailed information on a website would be because of a vested interest resulting from allergies or from scandals in the media. They needed a special reason to inform themselves.

"I don't think that I would look in the internet after having a link on a product"

"In cases of allergies or in case when I am not sure with some products [I would follow such a link]. But inert consumers as we are we would just look after a scandal. I must admit it. In cases something is exaggerated in the media, you become sensitive."

Some stated that they would not look for a hint on a product package and visit webpage because it is too much effort. Instead, they would like to have a smartphone app or a barcode scanner which makes things easier at the point of sale.

"I assume that people do not look on the product ingredients list every time they buy the product. In cases I have to decide if the product should be on my nutrition plan I am looking for the information, but if I did it every time I buy a product I would spend very much time in the super market."

"The problem is that in the super market I do not have internet. I will have to go home to look for it and then I most certainly forget it"

"There should be a barcode scanner in the super market which gives the opportunity to scan all the products I want to buy and tells me if there is GMO or not."

In principle website information is considered to be useful since interested persons will have the opportunity to investigate. Still most participants would try to find balanced information, as well as, clear and specific information about GMO advantages and disadvantages. They also would take into account who is running the website and what are the intentions. Taking into account the importance of the considered product most persons would not make an effort to follow a hint. Anyway a hint was considered to be good in general since it gives the opportunity to assess about the product if needed.

The usefulness of the website information was questioned in the **nano website** example. On the one hand, it doesn't state clearly hazards or concerns. Nearly all of the participants would like to have information which is brief and clear on the issue. On the other hand, most of the participants would not search for information about nano-silver chopping boards before buying it in the shop, since it is too much effort for such a simple product.

"I would never hit on the idea to search information about a chopping board before going to the shop and simply buying it."

Besides, the properties of products are more interesting than the fact that the properties are attained through nanotechnology.

"If nano is mentioned on a chopping board and the board has antibacterial properties, I think most of the consumers would focus on "antibacterial" than on the fact that the property is attained through nanomaterials."

However, a few participants were satisfied with the statement that a considerable amount of uncertainty still prevails since risk assessment studies are lacking. They would like to avoid such products as far as possible.

"I read the first paragraph and I would never buy a product which is labelled containing nano! That is crazy. I didn't know that! Nanomaterials are used but are not tested enough."

Some participants also searched for information who is running the website and why the information is presented. BEUC was not known and there was scepticism, since they could not be sure about the intentions of that organisation.

In comparison two aspects were raised in both focus groups series: first, the question who is running the website and why, second, whether the information is balanced and sufficient. In general interested participants were willing to visit such websites, some participants were criticising that such information is useless at the point of sale since it is simply not available when purchasing the product. In relation to the importance of the product hardly a few participants were willing to make an effort to inform themselves more deeply.

For the case of GMOs some participants were frustrated with regard to the amount of GMO-application in consumer products. They would even ignore the information or stated that this information would not influence their purchase decision since they did not think to have the possibility to avoid GMOs with a reasonable effort. Some also criticised that there is no information about product brands and therefore the information is too general and useless. Those issues were not raised in the nano focus groups since specific product brands were presented, but here some respondents stated to avoid nano products since there seem to be a considerable amount of uncertainty involved.

Comparison

In both cases the new technologies' products did generate some amazement, but no strong need for information, since the products are perceived being every day products. Therefore, more information on websites would not lead to the situation that consumers would use it. For the case of GMOs the participants did explicitly elaborate on ethical issues, such as freedom of choice. For the case of nano products there were some hints in that direction. The respondents indicated to appreciate more transparency on the use of GM and nanotechnology in the products, as well as more information on the effects on health and the environment. However, a pure nano label was considered meaningless or only relevant for commercial use. The same applied for the GM-free label, since there was no information about organisations certifying such products, as well as, knowledge about the standards of certification practices. Although they reported that under normal circumstances they would not notice all the labels, offering more on-package information was seen as positive, since the information is perceived as being more understandable for the case of nano and that the consumer has the possibility to gain an impression of the use of GMOs on the market in general.

In both cases the participants were, in principle, sympathetic to the use of websites to provide product information, but not as a replacement of on-package information because they would need the information at the point of sale. Especially at the point of sale alternative information sources would be useful: sales persons, barcode scanners or applications on smart phones. Those who didn't need the product and the information still had the opinion that the information should be available for others.

However, the participants expressed strong concern about the sources of information and the motives behind it. The labels presented to the participants were criticized because there was no information which stated who assigned the label. It was also considered difficult for consumers to assess whether they can trust the website.

5.1.5.6

Responsibility of actors

In the discussion touching the responsibilities of the government, producers, consumers, resellers, NGOs and the media different viewpoints were represented. The participants in general assumed that there should be responsibilities for every of those actors on the market. They also stated different responsibilities for different purposes: minimizing impacts or assuring safety and providing information for purchasers. There were different models of responsibility according to trust issues.

For the case of **GMOs**, on the one hand, most participants referred to possible negative environmental and uncertain health effect. Among those participants

especially organic oriented purchasers criticised the current system of shared responsibility with regard to safety evaluations done or the provided information along the production chain. On the other hand, some participants did not perceive any problems with GMOs and perceived possible positive effects especially with regard to the environment. They did not care as much as the organic oriented participants and the claim for improving the situation of responsibility was not so strong. In general, they were satisfied with the current situation. In the discussions the roles of consumers, producers, resellers, NGOs, and the government were issued, as well as media coverage and its impact on the awareness and behaviour of consumers.

In general, respondents assumed that more extensive media coverage would help to build awareness. However, the participants reasoned that because of the fact that no health hazards are occurring with GMO consumption and that environmental problems are not occurring in the EU, media coverage is in general very limited.

“The problem is that we do not have a big stake in the issue since environmental problems are not occurring in Europe but in other countries.”

NGOs like consumer organisations were perceived having not enough money to fulfil their duties which are to balance out the interests represented in product or technology safety discourses. Moreover, NGOs should also be responsible to give to consumers and/or citizens information about GMO products or genetic engineering as an additional viewpoint on the issue.

The government has the duty to require safety studies by producers or carry out safety studies before GMO products enter the market. They should control that the provisions are being implemented correctly. Most of the participants were agreeing on this responsibility. The legal basis should be the same in every EU country or even international regulations should be adopted to provide clear liability rules with regard to negative environmental effect. However, some participants stated that a national solution would be better since an EU solution would take too long.

“This is a nice wish but I think it would be more realistic to have national solutions. Since in Germany people are more organic oriented as in other states, things in Germany are likely to be changed more quick. I don't want to wait for EU-solutions this could take a while.”

Moreover, some participants claimed that because governments have the possibilities to influence the market they should support the local agriculture to slow down firms producing GMOs. They issued that consumers should have the possibility to choose and governments should assure the supply of alternative non-GMO products.

“Besides the information about GMOs in a product the consumer also need a freedom of choice. There should therefore also be products produced without GMOs.”

With regard to the information at the point of sale, producers should be obliged to provide detailed information in both ways: “contains GMOs” and GM-free labelling. Additionally, in the super markets there should be the possibility to access information about GMO products or genetic engineering. Besides the sales persons also other instruments should be investigated, for example smartphone apps or barcode scanners.

Consumer responsibilities are limited since not every consumer is aware about the effects and is able to buy more expensive, for example, organic products. Moreover, some consumers are distrusting producer practices by taking into account perceived motives.

“Consumers should be able to influence the market stronger. They should have a stake but in reality producers do not care for this. On the one hand, they will produce in a way to have higher profits and, on the other hand, they will try to conceal their practices. They do not really care for consumer interests as long there is no economic pressure. As long as they do not have to declare it, they won’t do it.”

However, participants stated that consumers have certain powers to influence the market and should have the possibility to choose between products with GMOs and without GMOs. Here, some participants issued the loss of trust in product labelling legislation.

“We all issued the problem that most consumers do not trust in information on products. That is a pretty bad development. We cannot control anything based on the product information since we do not trust it and use it to influence our purchasing decisions.”

Beside, they are aware that GMO products would be much cheaper than, for example, organic products and for different reasons some consumers look at the price and would buy the cheaper products anyway.

“There are differences between what consumers think and how they therefore act. I am a vegetarian because I don’t want life stock industries. Most of my friends do not want this kind of industry as well, but they buy their products as cheap as possible.”

In general, the participants were broadly aware of the possible negative impacts arising of their purchasing decisions. Yet, they admitted that they wouldn’t be aware of it when they were actually buying products in the super market.

In the **nano** focus groups, the respondents perceived a responsibility of the producers to only place on the market products that are safe. However, liability rules were questioned and some participants assumed that producers

would sell products mostly because of making profit. Therefore, producers should be obliged by the state to label products and there should also be controls.

Moreover, producers should give resellers adequate information to show them the amount of risks, as well as the amount of uncertainty of a product, to give them the ability to choose whether they would put the product on their shelves or not. However, some participants assumed that resellers also might be more concerned about profits than about risks which could occur on the long term. Here, liability rules were questioned also.

In the views of the respondents, the responsibilities to control for the implementation of labelling or safety requirements by producers are divided between governments and NGOs. While government should be responsible for registration and evaluation duties, the underlying studies should be carried out by independent institutes. There should be a form of obligatory information requirements for producers, besides independent information sources for consumers provided by NGOs. In this discussion the influencing power of the industries (*"lobbyism"*) was perceived being problematic. NGOs should therefore be supported financially to have a counterweight. Behind the background of industry influence on governmental decisions some participants also issued the lack of realization of public interests by governments.

Most of the participants acknowledged a responsibility of consumers. In principle, they should take care what they are buying and should also be able to exercise their market power. But the respondents also perceived problems on this behalf. They stated that not every consumer is able to understand advantages and disadvantages of nanotechnology and the products because the debate is currently too intellectual. Moreover, most consumers would not question nano products since there is no negative publicity in the press. Most of them would think that the products placed on the market are safe.

Consumers would also not be likely to read information on product packaging or websites since the products discussed are every day products. The discussion then covered the form of information on products which would be likely to influence consumers to inform themselves about nano, carefully consider the use and disposal of the single product or exercise their market powers. The examples where:

- Indicating nano on a product packaging,
- Indicating the modes of use on the product packaging, to show how to handle the product and which could serve as awareness raising means,
- Indicating the amount of uncertainty about a product on the packaging,

- Give them the possibility to inform themselves at the point of sale via shop owners, video screens and programs showing what nanotechnology is etc.

In **both cases** the questions on responsibilities resulted in general answers about the role of resellers, producers, NGOs, media organisations, governments and consumers, touching the abilities of the single actors, their motives and requirements to improve the situation. In both cases trust was issued. Therefore, some differences can be attributed to perceived antagonism (e.g. belief in the existence of opposed interests and goals). In the perception of consumers, especially GM may be more associated with big companies' profits than nanotechnology. Lobbyism was an aspect issued in both cases, as well as the role of NGOs which are perceived to be too weak to represent a counterweight to the economic interests brought forward by the industries. The participants were also well aware of the differences between consumers' awareness and financial capacities. With regard to media organisations the participants perceived a sceptical form of coverage for the case of GMOs and a clear positive one for nano. This situation was criticised to a certain extent, since the respondents are missing a balanced debate about the advantages and disadvantages of the technologies and related products.

The role of consumers was discussed thoroughly. Nearly all of the participants stated that the products on the market need to be safe. Additionally, some participants also wanted to have the possibility to choose between conventional products and the new technology products depending on their trust in governmental organisations or implemented systems of safety evaluation. The availability of honest product information seemed to be directly linked to that trust issue.

5.2

Austria

This chapter provides an overview of the results of the focus groups with consumers in Austria. It aims to summarize the results of the two case-studies (nano and GMO) in each thematic section.

5.2.1

Regulatory frameworks

5.2.1.1

GMO

The use of GMOs is regulated by the Austrian Gene Technology Act (GTA, 1995; last amended in 2005) which is also implementing EU Directive 2001/18/EC. More detailed requirements are included in several Ordinances.⁶¹

Austria was among the first countries in the EU to establish a labelling scheme for GM-free food products. A very strict threshold of 0.1% for traces of GM material was set (corresponding to the 0.1% threshold established by Austrian organic farmers associations⁶²). The requirements laid down in the Codex Alimentarius Austriacus do – in principle – not allow using food additives and processing aids from GM microorganisms nor GM feed (Codex Alimentarius Austriacus). Only in exceptional cases, for example if no GM-free products are available, additives and processing aids from GMO sources are permitted, e.g.

⁶¹ 1. Ordinance on Deliberate Release of GMOs into the Environment (Freisetzungsverordnung BGBl. II Nr. 260/2005) is also based on the GTA and contains in more details the requirements that have to be considered by applicants for the approval of a deliberate release of GMOs in Austria.

2. Ordinance on Public Hearings (Anhörungsverordnung BGBl.Nr. 61/1997, i.d.F. BGBl. II Nr. 164/1998) has entered into force in 1997 and has been amended in 1998. It prescribes in more details the administrative procedures that have to be considered in those cases where the above named GTA requires a mandatory public hearing. These cases are: applications for deliberate release of GMOs into the environment and contained use of GMOs in higher classes and at large scale.

3. Ordinance on Genetically Modified Seed (Saatgut-Gentechnik-Verordnung, BGBl. II Nr. 478/2001) has been passed by the Minister for Agriculture and prescribes a mandatory labelling for all genetically modified seed varieties covered by Directive 90/220/EEC. Furthermore the ordinance sets up thresholds for accidental contamination of conventional seed with genetically modified seed.

4. Ordinance on Arable Land for the Production of Seed (Saatgut-Anbaugebiete-Verordnung BGBl. II Nr. 128/2005) has been passed by the Minister for Agriculture and prescribes that contained areas for the production of seeds (determined list) have to be defined to ensure the quality of seed.

5. Ordinance on Thresholds of certain Genetically Modified Organisms in Feed (Futtermittel-GVO-Schwellenwert-Verordnung BGBl. II Nr. 394/2001) sets up a threshold of 1 % for accidental or technically unavoidable contamination of feed with GMOs.

Another Ordinance passed by the Minister for Agriculture (AEV Gentechnik BGBl. II Nr. 350/1997) regulates a limitation for emissions in waste water resulting from work with GMOs in containment.

⁶² The EU-Regulation on organic farming foresees a threshold of 0.9%.

in case of phytases, lysine, amylases, threonin and tryptophan as well as vitamin B2.⁶³

5.2.1.2

Nano

As with other EU member states, no Austrian regulation concerning the application of nanotechnology or nano-sized components in products exist. Nanomaterials first of all fall within the basic REACH regulation – directly applicable in Austria – and several legal instruments: The Biocidal Products Act, The Pesticides Act, The Medicinal Products Act, Medical Devices Act, the Food and Consumer Protection Act, Cosmetic Law and the Product Safety Act. In line with the corresponding EU regulation the Austrian rules do not explicitly define nanomaterials. Apart from sector specific regulation, there is no official authorization, notification or control procedure before products enter the market. Instead, there is a general responsibility for manufacturers, importers and vendors to protect consumers from hazardous products. In principal, the Product Safety Act covers all products including such with nano-components. Considering the legal instruments mentioned above, one Austrian regulatory specific is worth mentioning:

Plant Protection Products (Pesticides): Nano-Argentum 10 is a silver colloid containing silver particles with a diameter of 26 nm in a concentration of 10 ppm. As a nano-pesticide it has already been registered in the German list of pesticides, which automatically leads to authorization for the Austrian market. It can therefore be sold as a plant growth stimulant. The references provide no information about the de facto application (ITA, 2011a resp. NAP, 2009, pp. 44f).

5.2.2

Market situations

5.2.2.1

GMO

Austria produces about 50.000 tons of soybean (GM-free) and imports about 600.000 tons of soybeans. Some 400.000 of which are used for feeding hogs and some 100.000 tons for feeding cattle and poultry.⁶⁴ Environmental NGOs estimate that about 80% of all imported soybeans are genetically modified. Demand for GM soy comes not only from GM-free and organic food producers and farmers but also from conventional food producers and big retailers,

⁶³ http://www.ama-marketing.at/home/groups/24/Fleischforum_Leoben_2010/gentechnische_Entwicklungen_und_Futtermittel_Stoeger.pdf.

⁶⁴ [http://www.schweine.at/index.php?id=39&tx_ttnews\[tt_news\]=313&tx_ttnews\[backPid\]=1&cHash=d046ce5f2c](http://www.schweine.at/index.php?id=39&tx_ttnews[tt_news]=313&tx_ttnews[backPid]=1&cHash=d046ce5f2c).

in particularly from conventional producers of milk and eggs. Overall the negative public view pushed feed producers to look for alternatives to GM soybeans. As a consequence GM-free soybean cultivation in Austria went up over recent years.

Given its large share of organic farming (18.5% of total arable land) a wide spectrum of organic food is available in Austrian supermarkets. Organic food is GM-free as laid down in the EU Regulation on organic farming. Austrian organic farmer associations went even further and established a GM-free limit value of 0.1% - much stricter than the 0.9% included in the EU legislation. Moreover, a number of conventional egg and milk products are labelled as GM free. Food processors and supermarket chains avoid having food products labelled as GM on their shelves and therefore prefer food products from GM-free soy. Agricultural interest groups complain, however, that labelling of soybean oil and lecithin from GM soybeans is not being properly implemented.⁶⁵

Environmental NGOs are campaigning against the use of GM soy as feed and pushed the large retailers to ban milk and eggs from animals fed on GM soy from their supermarket shelves. As a consequence almost all feed stuff used for producing milk and about 80% of feed stuff for producing eggs are GM free.

5.2.2.2 Nano

Nanosilver can be considered as an element with nano-sized particles. Nanosilver, due to its microbial properties, is relevant for distinct and regulated product groups. A study done on behalf of the Austrian Ministry for Health (AMfH 2010, pp. 29) estimates the quantity of silver used in Austria for anti-microbial or anti-bacterial purposes to be 850 kg/a, thereof 110 kg nanosilver.

In the course of the Austrian NanoTrust research project, a survey of the Austrian market was given about consumer products containing nano-components according to product resp. producer declaration. This information were compiled in a dossier (ITA, 2009 a) and a study (AMfH, 2010, pp. 37ff). Whereas the detailed dataset comprising 480 products within 19 categories (28.9.2009) remains unpublished, 71 products are indicated to contain nanosilver. Out of them 65 are consumer products and 6 intermediates, the applications comprise:

- Paint and varnishes (3)
- Devices in terms of refrigerators, washing machines, air conditioners, vacuum cleaners and bread slicing machines (16)

⁶⁵ <http://www.landwirtschaftskammer.at/?id=2500%2C1577418%2C1363691%2C%2CeF9QSUNUX05SWzBdPTAmaW5saW5IPTE%3D>.

- Home textiles (5)
- Cosmetics and toiletries (6); f
- Food items (8) in terms of dietary supplements (6) and packaging (2)
- Medical devices (7) in terms of plaster, bandage, spray and coating; products for plants (1)
- Cleaners (5)
- Sanitary ceramic (1)
- Coatings (5)
- Textiles (6);
- products for animals (2)
- Miscellaneous (6) in terms of disinfectants, shoe deodorant and orthopaedic arch support.

Therefore the most prominent application of nanosilver in products on the Austrian market are devices.

5.2.3

Public debates

5.2.3.1

GMO

In 1996/1997 a broad coalition of NGOs including environmental, animals rights, church groups, and unions supported by the most influential Austrian tabloid launched an anti-GMO referendum which received strong support from Austrian publics. The fierce debate put Austrian publics and stakeholder groups on alert and reinforced resistance to adopt GMO crops and food. This translated into an anti-GMO policy backed-up by a broad consensus across all political parties.

Austria is still upholding several bans of GM crops authorised for commercial cultivation in the EU in five cases.⁶⁶ More recently a national safeguard measure on cultivation of GM potato EH92-527-1 was issued. Bans on certain GM foods were withdrawn as a consequence of the US-EU WTO conflict over GMOs.

⁶⁶ Namely the placing on the market of three genetically modified maize lines (MON810; MON 863; T 25) as well as the placing on the market of two genetically modified oilseed rapes (GT 73; Ms8/Rf3 and Ms8xRf3), Austria has issued a ban for import into and cultivation in Austria (measures taken in accordance with Art.16 of Directive 90/220/EEC and Art. 23 of Directive 2001/18/EC resp.).

All nine Austrian Länder have introduced coexistence legislation (“Gentechnik-Vorsorgegesetze”⁶⁷) all of which are posing additional statutory requirements on growers of GM crops. Moreover, national and regional sustainability policies have discouraged GM crop cultivation and favoured organic farming. The negative political climate and the regulatory burden are effectively discouraging field trials with GMOs.

Austria’s anti-GMO policy has to be understood in its political, socio-economic, and geographic context. Austria does not have an agbiotech industry. University research in molecular genetics focuses largely on medical and industrial applications, with only a few groups active in plant biotechnology. Austria’s agriculture predominantly small scale with more than 80% of the farms located in disadvantaged partly mountainous regions. Therefore, there is little reason to focus on intensive agriculture and mass production only. As a result of a policy change 30 years ago Austria has ever since focussed its agricultural policy on quality products and sustainable farming. As a result, by 2010 the proportion of organic farming reached 18.5% (total arable land) which is by far the highest proportion in the EU. Furthermore, according to views of conventional farmers’ first generation GM-crops have little to offer for the Austrian context.

Support for GMOs is essentially limited to certain university scientists but even they do no longer speak up in public in favour of GMOs.

After the 1997 referendum environmental and consumer NGOs as well as organic farming groups continued to campaign against GMOs and to influence policies. On the EU level Austrian policy makers have been working to highlight shortcomings, uncertainties and inconsistencies in GMO risk assessment and to render assessment procedures stricter. On the national level Austria introduced several bans against GM crops authorised for cultivation. Austria also established strict statutory requirements which essentially would make it difficult for any farmer to grow GM crops.

The anti-GMO stance has meanwhile become deeply embedded in the attitudes of Austrian publics. This is reflected by a low level of support for GM food and GM crops which remained continuously low over the last 15 years (Eurobarometer 2010a). Numerous regional development and farmer initiatives as well as various quality labelling schemes have excluded GMOs and GM food essentially putting GMO on essentially the same level as pesticide residues and contaminants in food.

Recent debates on GM food have focussed on the extension of labelling to also animal products such as milk and eggs fed on GM feed (essentially about

⁶⁷ http://www.bmg.gv.at/home/Schwerpunkte/Gentechnik/Rechtsvorschriften_in_Oesterreich/Gentechnik_Vorsorgegesetze_der_Laender

the use of GM soy in feed). Environmental groups successfully pushed the big retailers, and milk as well as egg producers to replace GM soy.⁶⁸

5.2.3.2

Nano

The topic nanotechnology was repeatedly discussed in the Austrian Parliament beginning with 2007. Requests to responsible ministries were made if existing regulation on worker and consumer protection is sufficient to combat risks from nanomaterials or if a moratorium should be taken into consideration. The answering ministers generally referred to ongoing activities at the EU and OECD level and denied the need for a moratorium (ITA 2011a).

The government committed itself to an Austrian Nanotechnology Action Plan (BMLFUW 2009) developed by four working groups (environment, research, economy, health) throughout 2009. The NAP is thought to identify the Austrian needs for action with the long term perspective set on the end of 2012. The content of the Action Plan focus on identifying the specific needs for action in Austria and intends to develop specific recommendations to stakeholders, mainly policy makers and interest groups. Therefore an analysis is made on the current situation in Austria; recommendations are given for further activities. The activities are concerning legal matters (e.g. REACH regulation, voluntary matters), awareness building (e.g. informing the public), risk assessment and risk management (e.g. EHS - Environment, Health, Safety) and research activities. The recommendations are time-limited, i.e. short-term (end 2010), medium-term (mid 2012) and long-term (end 2012). The implementation of the recommendations will be monitored in the first of 2012 with the whole of the stakeholders and a progress report drafted.

The Austrian NanoTrust Project starting in 2007 was mandated by the Austrian government to show up regulatory deficits, document scientific knowledge and accompany public debate. One of the tasks of NanoTrust is to show up possible regulatory deficits. Thus, several dossiers are drafted under the project (ITA, 2009, 2011a,b) and serve as a considerable source for remarks. Moreover NanoTrust organized several workshops and stakeholder conferences to stimulate discussion about regulation.

5.2.4

Interviews with stakeholders

The interviews with national stakeholders were not carried out in Austria.

⁶⁸ e.g. <http://www.greenpeace.at/3815.html>.

5.2.5

Focus groups

In Austria two focus groups were carried out: one for nanotechnology and one for biotechnology. For the GM focus group it turned out that the time slot were not enough to unfold group discussion and the feedback gained is more of an interview type. It was found that the role of the stimulation material (input) is important to establish a minimal common standard of knowledge and helpful to induce discussion. In Austria the focus groups were carried out on Jun 25 2011 and July 7 2011 resp. 9 (nano) resp. 8 (GM) persons attended the discussion groups.

5.2.5.1

Participants

The participants of both focus groups were nearly all living in the city of Graz and were heterogeneous in terms of socio-demographics and profession. Both focus groups cannot be considered representative with regard to gender, age and education.

The following tables show the gender, age and education distribution of the focus groups compared to the Austrian population (Source: Statistik Austria).

Gender distribution (2010)		
	<i>Male</i>	<i>Female</i>
Population %	48,7	51,3
Nano sample in %	55,6	44,4
GMO sample in %	37,5	62,5
All focus groups in %	46,6	53,4

In terms of numbers, the women's views were stronger represented than the men's views.

Age distribution (2010)					
	<20	20-40	40-65	65-80	>80
Population in %	20,7	26,3	35,4	12,8	4,8
Nano sample %	0,0	88,9	11,1	0,0	0,0
GMO sample in %	12,5	50,0	37,5	0,0	0,0
All focus groups in %	5,9	70,6	23,5	0,0	0,0

The focus groups missed out the point of views of person under 20 and over 65 years. In comparison to the population the views of 20-40 years old persons were clearly overrepresented.

Education distribution (2001)		
	University	Other
Population in % (base: persons 15-65 year)	7,5	92,5
Nano sample %	11,1	89,9
GMO sample in %	37,5	62,5
All focus groups in %	23,5	76,5

With regard to the different levels of education the focus groups were not representative, as well. For both focus groups series the respondents with university degrees were overrepresented.

5.2.5.2

Response to the focus groups

The focus group guidelines turned out to be an appropriate instrument for gathering information about practices and beliefs: though certain questions were considered redundant or fuzzy. The time allocated for the focus groups (2 hours group discussion) did not allow for an in-depth discussion. On some questions participants dropped keywords without further explanation.

5.2.5.3

Perception and knowledge of the technologies and products

In the nano focus group the associations to 'nano-products' altogether highlight applications which actually reach consumer: easy-to-clean surfaces, cosmetics (sunscreens?), car varnishes and functional clothing. In case of nano-silver, antimicrobial activity and smell repellency were mentioned. However, there was no familiarity with a "nano-silver chopping board".

While chopping boards were considered as familiar and widely used toolkit for food preparation, the majority of the participants in the GM group do not use to consume margarine. So they responded to the questions as if they would use margarine on a regular basis.

Genetic engineering and its products

Participants mentioned a broad range of applications linked to the GMO issue such as food, medicine and industry. For GM soy benefits for producers and

potential negative environmental impacts were associated. The application of GM in agriculture was generally associated with certain economic benefits (cost reduction and yield increase), intensive agriculture and thereby linked to environmental problems such as deforestation. Most participants were not aware of GM margarine and few participants draw a link between soybean and margarine. Perception of GM products seems to be polarised among participants though a majority of the participants were highlighting possible negative impacts of GMOs and drawing links to factually unrelated controversial issues (clone sheep Dolly, BSE).

Nanotechnology and its products

Associations mentioned by the group include everyday products such as clothing, cosmetics, food and cleanser. Easy-to-clean surfaces were associated with 'water dripping off'. Then a query was particular on Nano-silver and it was correctly associated with antimicrobial activity and corresponding product applications ('*something against smell of sweat*', *adhesive plaster*). It was found that the utilities supplied (two real chopping boards with nano-labelling) raised interest, stimulated discussion and made the issue more tangible.

Decisive criteria when buying a chopping board were price and convenience (easy to clean, easy to store, suitable for dishwasher, no maintenance needed). A few participants discussed about the 'bacteria problem' arising from bacteria especially on wooden boards. Comparing nano-chopping boards with conventional ones, the statements were consistent in terms of higher price, but there was hardly a notion of product safety and product risks. Also potential environmental risks (production, waste) were out of scope.

Participants were sceptical with respect to producer's claims:

Producers can betray, who certifies the effect resp. benefit?

The durability of the coating was doubted:

Can it be the same like Teflon which vanishes over time? Does the board stand treatment in dishwasher?

Additional energy and resource use in the production phase was mentioned.

Long term effects remain unclear

Comparison

In the case of nanotechnology, the participants had some correct associations with the topic nano-products and the type of product (nano-chopping board) addressed, Familiarity and relevance was principally given, all participants had any practice or tangible experience with a nano-chopping board. Notably there was hardly any environmental or health risk perception before the concrete chopping board with the fictitious nano-labelling ('contains nano-silver')

was circulated among participants. This product immediately provoked repulsing associations about contaminated foodstuff and creating small nanoparticles through cutting.

Considering the gathered associations to 'nano-products' they altogether highlight applications which actually reached the ordinary consumer: Easy-to-clean surfaces, cosmetics (sunscreens?), car varnishes and functional clothing. In case of nano-silver, the antimicrobial activity and smell repellency was correctly mentioned only from one participant. But none of the participants had any association to a 'nano-silver chopping board'. While chopping boards were ascertained as common toolkit for food preparation ("importance for my nutrition" mean value: 7.8), the majority of the participants in the GM group didn't consume margarine (Rating "importance for my nutrition" mean value: 2.3). So they were forced into the role of buying margarine more often. It appears that there was more familiarity with soybean milk as a typical 'soy' product.

Participants asked to differentiate possible impact dimensions between the GM and GM-free margarine, most frequently opted for *lower safety/health* (5 out of 8). Participants asked to do the same for a conventional and a nano-silver coated chopping board, most frequently opted for *higher price* (5 out of 9). While no participant associated the nano-product with environmental aspects, 3 participants of the GM focus group anticipated environmental effects. These results indicate, that nano' is more easily associated with added value, low environmental risk and higher price, while most of the participants agreed that GM food in general has a negative connotation.

5.2.5.4

Purchasing criteria

For the participants chopping boards are of considerable to high relevance for their daily life. This does not mean, however, that they would make huge efforts in purchasing them. Criteria mentioned as decisive for buying indicate, that the convenience as well as the price is of importance: Easy to clean, to store, to be washed in a dishwasher. There is no excessive maintenance needed such as lubricating wooden boards

Conventional margarine and GM-margarine

Very few participants use to buy margarine. Those not using margarine responded by imaging a role as a margarine consumer. Price and quality were mentioned as important and improved health and convenience (low cholesterol, softness – spread easily) were attributed as benefits of margarine compared to butter. Participants differentiated between production process and ingredients. The latter were considered to be more important. GM was rather perceived to be a food ingredient issue than a processing issue. Health and safety properties were considered by a majority of the participants with most

of them assuming overall safety and health to be lower for GM-margarine. One participant who is working as a scientist in the field of genetics assumed that health and safety could be higher in case of GM soy margarine. The number of participants considering GM as environmentally sound equals to those assuming the opposite. The majority of participants claimed that GM is relevant for their buying decisions. They also mentioned that quality and price are important criteria. Some participants favoured quality over price others claim to do it the other way round highlighting that not everyone can afford to prioritise quality over price. The majority of participants claimed that they would not buy GM margarine. A minority either expressed their will to give GM margarine a try or did not care at all about GM/GM-free as criteria. Participants agree that avoidance of GM food is more likely to be expected among consumers. Most participants agreed that GM food in general has a negative connotation.

Conventional chopping boards and nano-silver chopping boards

Environmental and health risks were rarely associated with nanotechnology in general nor with nano-silver in particular. Only one participant mentioned increase in energy and resources in the production phase.

Long term effects remain unclear

But this is not really surprising: In contrast to GM risk debate the risk debate on nano-silver has not reached the mainstream media, hence one cannot expect broad risk awareness from the ordinary consumer.

The only added value of the nano-equipment was (at least partly) seen in tackling the 'bacteria problem'. The argument that especially wooden boards imply the risk of bacterial contaminations and advice was brought forward by the focus group participants. One female participant advised to wash the wooden board with cold water and dry it in the sun. Consequently, the hygienic aspect is seen as the most prominent purchasing argument:

more healthy since antibacterial

a person, which cooks frequently and with passion and strongly aligns to hygiene;

At the same time hygiene was mentioned to induce or exaggerate a prevalence for allergy due to a lifestyle of too much avoiding contact with microbes (e.g. in the child age).

For children it is important to get in contact with germs to prevent emergence of allergies; I have never heard from sickness associated with the use of chopping boards

There were also doubts if there is a real need for this particular hygienic measure:

I have never heard from sickness associated with the use of chopping boards

Doubts were raised on the durability of the nano-coating:

Can it be the same like Teflon which vanishes over time? Does the board stand treatment in dishwasher?

The issue was discussed on a very theoretical level and over time triggered considerable rejection. None of the participants had personal experience with nano-silver covered surfaces or chopping boards, therefore the following statement can be seen as an example for the group discussion:

I don't know what nanosilver is, sounds scaring, chemically, dangerous

Comparison

For the nano-products, participants mention some key-terms (functional clothing, antimicrobial activity, easy-to-clean), though the practical experience was very limited. There was no personal experience at all with the focal product and the group discussion was reluctant and led on a very theoretical level. More emotional reactions were provoked when the nano-chopping board (together with the fictitious labelling) was distributed; the majority was expressing rejection and doubts. The relevance of the product as such is given, since it is used by all participants in their daily life. According to this there is a common need of easy handling, storage, cleaning, but not for anti-bacterial activity, which is seen as the added value of the nano-chopping board. Such a need is ascribed to persons who strongly align to hygiene and frequently cook. Thus it appears that the participants perceived the nano-board as a niche product for high standards, but not for ordinary consumers in their daily life.

Most participants rarely buy margarine whereas chopping boards are used by almost all. Most participants were not aware of nano-chopping boards and none of them knew GM margarine. Consequently statements were based on the assumption to buy and use such products. Price was mentioned as a key criterion for both products, in case of margarine quality and in case of chopping board convenience were further key criteria. For the GM margarine the participants could not identify any advantage relevant for the consumer and it is supposed that advantages solely lie on the producers' side. For the nano chopping board a potential health benefit was identified. In particular it was supposed, that the nano chopping board would attract cooks with high aspirations in hygiene. The majority of participants were concerned about the health, safety and environmental properties of the GM product. GM-free margarine would therefore be preferred by a majority. If GM margarine would be cheaper than GM-free margarine those who prioritise price would probably buy the cheaper product.

5.2.5.5

Consumer Information

Response was stimulated in a first step by circulating the fictitious nano- and GM-products (chopping board and margarine) with the respective labels attached and in a second step by a presentation of a consumer information website. Both stimuli led to more emotional reactions compared to the more theoretical discussion triggered by the questions of the focus group guidelines.

Labels: GM-free label and nano-product label

All participants confirmed that they are familiar with the GM-free label (the official Austrian GM-free label was used). However, no one had seen before the labelling information "produced from genetically modified soy beans". Some participants acclaimed that in case of familiar brands they would most probably not check the package carefully and would therefore not be aware of the GM ingredient. If they would not be familiar with the brand they would check the package more carefully. Some would prefer a more visible indication on the front side of the package but acknowledged that this is unlikely to occur. It seems to be important if the GM-free label is registered or not. Participants were split in respect to the relevance of the GM-free label for their own buying behaviour: A (smaller) group claimed that they either don't care about GM/non-GM information or are willing to give it a try.

Since no nano-chopping board was easily available (except by means of online chopping), it was chosen to use a conventional and originally packed chopping board for the focus group. The chopping board was made 'nano' by means of the affixed "nanoprodukt 10^{-9} " logo. Some participants recognized the scientific notation "ten minus nine". None of the participants had seen this label or a similar nano label before. The feedback is included in chapter 1.3.2. In the nano group there was a huge variance when the participants were asked if the 10^{-9} logo would influence buying of a chopping board. The average in relevance was 3.7 (1: lowest relevance, 10: highest) with a high variance. From some participants, the 10^{-9} logo was positively associated; from others it was however critically evaluated. The split feedback in particular was:

I find it unnecessary, it's like a logo

It's a scientific writing style, but this in type of information doesn't interest me as a consumer. I would prefer: "This product is with nano..."

it appears ineffective, irrelevant, non-appealing

it's appealing in design; it is different;

a conjunction with a certification would be better;

There was a clear rejection of the inscription 'contains nano-silver' on a chopping board (presented as a powerpoint slide). Typical notions were:

I don't know what nanosilver is, sounds scaring, chemically, dangerous
I have the notion as if everything will be full with nanosilver after cutting
Instead it was proposed to inscribe 'with nanosilver'.
with nanosilver' sounds better
my mother would call me and ask: what is this?

Both labels were not perceived as really useful, especially the term 'contains nanosilver' provoked negative associations. However, the GMO-free label was appreciated by some participants as a kind of safety signal, which makes the market more transparent. In comparison, the more detailed information was received more positively by the participants than the unfamiliar labels. In both cases, the reception of the information was largely dependent on what consumers expect to find. Most consumers (except vegetarians and people with allergies) do not expect to find relevant information in a list of ingredients. In contrast, consumers do expect more information about distinct product attribute claims, such as the antibacterial effects.

More detailed product information

Skipped (information integrated in previous chapter)

Website information

In the GMO group web-based information on GM food and on particular products was generally positively acknowledged. Some participants mentioned that they would be willing to check a website indicated on a food package. Lack of convenience (cannot check it in the supermarket) was highlighted as an obstacle. One participant favours information provided face-to-face as with web-based information it is more difficult to identify the interests behind. Participants were split when valuing the web site presented with a majority considering it as valuable. Criticism was raised with respect to the terminology and on the complexity – not really helpful for directly assisting consumers in their buying decisions.

In the nano-group, the nano-chopping board entry on the BEUC website was adopted from a real nano-chopping board provider in the internet.

The presentation of the BEUC website and the (virtual) nano-silver entry in the BEUC nano-products inventory was reluctantly accepted: Although the website was judged as *reliable*, the nano-silver entry was criticised for lack of safety information. In particular there was low willingness detectable to utilize the internet as an information source for a nano-chopping board. But this has to be valued against the background of a low (safety) relevance assigned to an 'ordinary' chopping board. Altogether the value of the information source was scored rather low (1.8).

Hard facts already at the beginning

I wouldn't scroll down
looks reliable
from the European Consumer Organisation I would expect more
fine that it is in german

In comparison, in both cases the main points mentioned by the participants were their level of interest in an issue and their trust in sources of information. In general, the opinion was that a website can be useful as an additional and complementary source of information to a product package, but that it is not enough. The BEUC webpage was altogether perceived as reliable but not as very convenient.

Comparison

The feed-back on the nano and the GM product differs since the message of the labels also essentially differs: While the nano-label indicates that there is nanotechnology present in the product, the GM quality mark assures the absence of GM technology⁶⁹. The nano-label was adapted by the researchers whereas the GM-free label was the original Austrian GM-free label. Not surprisingly, all participants confirmed to be familiar with the GM-free label. The GM-free logo contains text which is self-explanatory ("gentechnikfrei"), whereas this was not the case with the nano-label. The nano-label induced both positive (*scientific writing style, appealing design*) and negative responses (*not relevant, ineffective*). Margarine is purchased in everyday live routine, this is however not true for chopping boards. (Lack of) routines may shape buying and information behaviour and lead to a further inspection of the product. As chopping boards are not an item of shopping routines it can be expected that consumers might more carefully inspect their label. However, as chopping boards can also be considered as a less 'affecting' product compared to margarine consumers might be less interested in the label and only pay attention if the labelling would provide a clearly visible difference to a conventional product.

Familiarity and associations seem to be more similar in case the ingredient lists include a notion "containing nano-silver" or "produced from genetically modified soybeans". For the nano product there was a clear rejection of the inscription 'contains nano-silver' on a chopping board. Typical notions were: *Sounds scaring, chemically, dangerous; I have the notion as if everything will be full with nanosilver after cutting*. Instead it was proposed to inscribe 'with nanosilver'.

⁶⁹ It should be reconsidered if such an approach ('positive versus negative labelling') is appropriate for comparisons.

Response to the nano and GM web-based information differed: The feedback on the GM website was more positive than on that on the nano website. It seems that participants are more motivated to check web-based information on GM margarine (food) rather than on chopping boards (non-food kitchen equipment). For lack of convenience (supermarket setting), even for the margarine the participants would probably not check web-based information. Some participants mentioned that they would look for internet-based information and also check a website if it is indicated on the food package. In general the maker of web-based information is considered a key issue (*"who is behind that website"*).

5.2.5.6

Responsibility of actors

The interview guide included several questions which actors are considered responsible for minimizing negative impacts from consumer products and b) ensuring that consumer have sufficient information about products.

In the GMO group participants referred to EU- and state level authorities, producers and consumers (NGOs). Neither retailers nor exporting companies were considered responsible. Authorities and NGOs could play a role in supervising the information provided. Both EU- and state authorities are clearly seen to be in charge of safety issues and to avoid negative impacts. It is however, not entirely clear if their role should be limited to a supervisory function. Participants were reluctant to concede more responsibility to the consumer.

In the nano group, participants ascribed the responsibility for product information mainly to the producers and to a lower extend to the EU. In no case Austria, retailers or the consumers themselves were mentioned as responsible actor. It can be concluded that the safety issue is aligned with that and therefore the participants allocate this question primarily to the producer and a little less to the regulator.

There was a considerable confusion about the actors responsible for minimizing environmental impacts. This can be at least partly conceded to the complex sectoral regulation for product applications (chemicals, cosmetics, pharmaceuticals, pesticides, biocides etc.), manifold and confusing labelling systems and regulatory bodies (nation, EU) which makes it virtually impossible to locate responsibility correctly. Therefore denominations ranged from the producer to the Environmental Ministry to the European Commission. Considering the role of the consumer the discussion focussed on the issues 'waste disposal', 'waste management' and 'packaging'. Considering this the role resp. relevance of the consumer was differently valued, for instance: *Should I write to Sony, that they should no wrap the CD I buy? Versus: Demand is important, consumers decide through what and how they buy.*

In comparison Participants ascribed the responsibility for product information mainly to the producers and the authorities. In the Nano group no responsibility and in the GM group a minority of participants assigned responsibility to consumers⁷⁰. National retailers were not considered responsible. No clear pattern emerged in case of responsibilities for minimizing negative impacts. In both groups national and EU authorities are seen to play a key role, in the nano group a greater role for producers was considered.

5.3

Finland

This chapter provides an overview of the results of the empirical work in Finland. It aims to summarize the results of the two case-studies (nano and GMO) in each thematic section.

5.3.1

Regulatory frameworks

5.3.1.1

GMO

In Finland the use of GMOs is regulated, above all, by the Gene Technology Act (377/1995). The official aim of the Act is to promote the safe use of gene technology. This progress should pay respect to the precautionary principle, be ethically acceptable and protect human and animal health and the environment. The Gene Technology Act implements the EU directive 2001/18/EC. The Act also regulates the contained use of genetically modified plants, animals and micro-organisms. Gene Technology Act is complemented by the Government Degree on Gene Technology and by a number of statutes given by the Ministry of Social Affairs and Health. Legislation has been amended several times since 1995.

In April 2009 the Government decided that farmers have the right to GM-free production and consumers to GM-free products. Finland's objective is to obtain a national decision on GM varieties to be grown on its territory. Currently, the EU has not approved any genetically modified varieties that could grow in Finland.

At the time of writing the Parliament is discussing Government proposal on the production of transgenic plants. The law would enact rules for the cultivation of GM crops and for the co-existence between GM and non-GM crops. The Ministry of Agriculture and Forestry of Finland predicts that the first consent it issues for the cultivation of a transgenic in Finland is likely to apply to a

⁷⁰ It could be a shortcoming, that the shortlist provided by the FG-guideline didn't include explicitly the term 'consumer organisations' as a choice.

potato variety (Valve 2011). A field trial of a variety with refined starch content is already in progress.

In Finland, no national schemes for labelling of GM products exist.

5.3.1.2

Nano

Currently there are no Finnish laws regulating the use of nanotechnology or products containing nanomaterials. In 2008 The Committee for the Future of the Finnish Parliament ordered a study titled 'The risks and possibilities of Nanotechnology'. However, the report managed to provoke little discussion. According to an often expressed view it would be important to minimise potential harms for human health and the environment. A sound regulatory basis would provide robust conditions for innovation and commercialisation. At the same time 'fears and prejudices can be prevented by sufficient research, testing and publicity' (The chairlady of the Committee, MP Matikainen-Kallström 5/9/2008⁷¹).

Finland is a member of the EU and accordingly follows the EU regulations. It is actively participating in REACH competent authority (CARACAL) subgroup on nanomaterials (CASG-nano) and in the development of technical guidance how to apply the regulation on nanomaterials in RIP oNs 1, 2 and 3. All the competent authorities for REACH, biocides, plant protection products and most other chemical safety issues are now nationally integrated to the new Finnish Safety and Chemicals Agency. Similarly the work on novel foods and cosmetics is followed at EU level.

In Finland, no schemes for labelling of nanotechnology applications or products containing nanomaterials exist.

5.3.2

Market situations

5.3.2.1

GMO

In Finland few GM labelled products are on the market. The only exception is GM soy feed which can be purchased for the feeding of pigs and poultry. In line with EU regulations, Finnish legislation does not require labelling of foodstuffs that have been produced with the help of GM soy feed. No voluntary schemes exist either. However, for a short while the largest milk producer had a "GMO-free" statement in its cartons.

⁷¹ <http://tietystitemp.aka.fi/fi/A/Suomen-Akatemia/Tama-on-Akatemia/Ajankohtaista/Nanoteknologian-mahdollisuudet-ja-riskit-puntarissa/>

Despite no actual GM markets exist in Finland; it is possible that textiles made from GM cotton are on the market. These products need not to be labelled. The same goes for cut flowers (carnations). In addition, many products on sale contain traces of GM products. Between 2005 and 2007 the Customs Laboratory found such traces in about one quarter of corn or soy-based food items. If any of the raw materials for the GM content exceeds 0.9%, it needs to be indicated on the label.

5.3.2.2

Nano

According to unofficial estimates, an extending number of products containing nanomaterials are on the market although there is no means by which to monitor this progress. The variety of consumer products is large, including cosmetics, medicines, electronics, car waxes, tennis rackets, paints, textiles etc. Recently nano-skies have received a lot of public attention, the key question being their functionality.

5.3.3

Public debates

According to the Eurobarometer survey 2010 Finns can be regarded as technology optimists. The figures show that the trust on biotechnology industry is highest of all EU member states. The level of awareness of emerging technologies is relatively high, too (Eurobarometer 2010a).

5.3.3.1

GMO

General attitude towards supporting of biotechnology has been increasing. The index of optimism for biotechnology/genetic engineering is 59, and as such one of the highest in the EU (Eurobarometer 2010a). Notably, in the same survey 64% of the Finnish respondents stated that the development of GM food should not be encouraged.

In 2010, out of all Finnish farmers, 69% opposed cultivation of GM crops (Maaseudun tulevaisuus 2010). Only 4% of producers would allow it without restriction and less than a quarter if safe co-existence with conventional crops can be guaranteed. Majority of farmers is also against the use of genetically modified feed. In Finland, GM soy is most commonly used for pig feed. Indeed, nearly half of the pig farmers were, according to the same survey, receptive to GM feed.

Organisations opposing gene technology in Finland have created a joint 'GM free Finland'-campaign. Whilst gene technology can hardly be described as a hot topic in Finland, the anti-GM lobby has been relatively active. The lobby is against of all deliberate releases, including field trials (Valve and Kauppila

2008). In the beginning of the millennium some field trials were even sabotaged.

Characteristic to Finnish public debate on GMOs have been its polarisation (Rask 2006). The active counterparts have been, on one hand, scientists working in the field of genetic and genomics and speaking in favour of gene technology, and, on the other hand, NGO activists very much against its use. Civil servants responsible for the regulation of deliberate releases have tried to balance in the middle.

The draft law on co-existence has, however, somewhat blurred the setting. Interestingly, it seems that scientists do not have a common view on the sound and reasonable rules of co-existence. Whilst one group collected a petition against the proposed rules, arguing that they would even cause harm the future of biotechnological research, some other others have pointed that such a worry is an overstatement. Meanwhile the organisations gathered under 'GMO-free Finland' oppose the law simply because it would create legitimate conditions for GM cultivation in Finland.

5.3.3.2

Nano

The 2010 Eurobarometer survey suggests that Finns are very willing to encourage the development of nanotechnologies. Indeed, it seems that nanomaterial and nanotechnologies are rather associated with positive than negative qualities. On the other hand, one could also argue that nanotechnology is not a public issue in Finland. Occasional opinions can be found from the internet, but no public campaigns exist – if official innovation policies and programmes aiming to enhance research and innovation are not counted.

The various ministries have established an ad hoc discussion forum on nanotechnology in order to follow and participate in the national and international discussions. There are plans to establish this group formally during the early part of 2011.

5.3.4

Interviews with stakeholders

5.3.4.1

Nano

Only four organisations were willing to give their responses concerning nanotechnology. The respondents represented a civic organisation (NGO), two interest organisations and the scientific community. Their professional roles regarding nanotechnology and nanomaterials were related to textiles, chemicals, manufacture of products containing nano components or materials, and the implementation of REACH legislation.

Until now nanotechnology and its regulation have generated very little public debate in Finland. A lack of knowledge seems to prevail among both consumers and NGOs. The lack of information and public debate on nanomaterials is evident from the responses. Several uncertain answers (“No opinion”) were given for among others the questions concerning the risks of nanosilver and nanomaterials and the current and effective labelling schemes of nano products.

Main concerns/risks and uncertainties relating to nanosilver

The respondents perceived cosmetics together with textiles and biocides as the most potential sources of health risks from nanomaterials. None of the respondents mentioned food or food packaging as the most potential risk source. Particularly biocides and textiles but also pesticides were considered to have the highest potential to cause an environmental risk from nanomaterials.

The most important concerns regarding nanomaterials in the given product groups included the potential health risks (e.g. cancer) such as the use of cosmetics on skin and the human exposure due to use of textiles. Also the environmental impacts due to the potential release of nanomaterials from products and the subsequent discharge to sewage and eventually to nature raised concerns. Generally the use of nanomaterials was considered to be relatively uncontrolled in some fields and the safety of nanomaterials too unknown.

All respondent raised some concerns over the health and environmental risks of nanosilver. The issues of concern regarding nanosilver included the potential dissolution in water or the aquatic environment (Is it a genuine risk?), the resemblance to mercury on a particle level and the possible release of nanoparticles and their effects on living organisms such as useful bacteria or enzyme functioning. Mentioned concerns also included problems in sewage treatment plant functioning and further to the environment (due to sewage residue or use of agricultural sludge) in the case of a more extensive use of nanosilver

None of the respondents answered the question on the importance of products with other nano metal-components compared to nanosilver. Most respondents found that nanosilver should receive more attention in their organisation.

Dissemination of information: product information through labelling

There was uncertainty regarding the current labelling scheme of nano products among the respondents. All respondents were in favour of strengthening labelling (not markedly labelled products; more visibility required; more products should be included the scheme). The perceived advantages of labelling schemes included the correct use of products, a minimisation of harmful effects and an increase in the awareness of consumers (informed choices) and

producers (Producers have the responsibility for product safety) and the subsequent recognition of a need for a public debate and a labelling system. Some disadvantages of labelling were also identified including additional costs and an increase in product prices. The latter was, however, also seen to potentially restrict the unnecessary use of nanomaterials.

One of the respondents saw that their opinion on nanomaterial labelling was heard and one that it was not (We are not a big actor and operate reactively in this issue with a critical voice demanding for objective research). None of the respondents was familiar with a nanomaterial labelling scheme that could be adopted in Finland.

Perceived role and behaviour of consumers

All respondents agreed on that there should be a more extensive public debate on nanomaterials in Finland. Particularly the role of consumer behaviour (compliance, handling) in risk prevention divided the views of respondents ("Most consumers are not interested in product labelling information"). One viewpoint mentioned missing from the public debate was the behaviour of nano[material]s in waste incineration.

Regulatory challenges

Not asked in Finland.

Public engagement and participation

All respondents agreed on that European stakeholders generally give adequate consideration to national points of views when engaging in participatory procedures at the European level (1 strongly agrees; 3 tend to disagree). However, there were divided responses to whether the national viewpoints on nanomaterial regulation were taken into account at European level (1 tends to agree, 1 tends to disagree, 2 had no opinion). One respondent pointed out that that activity of organisations is essential when dealing with European stakeholders. The most significant forums for stakeholder discussion at European level included EEB, EOS, EU CASGnano and OECD.

5.3.4.2 GMO

7 organisations out of 15 contacted responded. Most respondents represented civic organisations (4), one two interest organisations (Finnish food and drink industries' federation, The Consumers' Association of Finland) and one authorities dealing with GMO authorisations.

The respondents were working with issues related to food stuffs, food additives, enzymes, GM-trees/timber, GM-cotton and ornamental plants (in other words, these specific species or topics were at the time topical).

Main concerns/risks and uncertainties relating to nanosilver

Food production and foodstuffs – including animal feed and its production – were named as the most likely and most worrying sources of health and environmental risks. Food additives, pharmaceuticals and enzymes are raised as potential sources of health risks. Most likely sources of environmental risks/harm: gm-cotton and gm-trees, gm-soy, all wind pollinating plants.

The stated worries were biodiversity loss, decrease of the freedom of choice of consumers, genetic pollution and to increase vulnerability of the third world producers. Industry representative (Finnish food and drink industries' federation) had no reason to worry over the risks of GMOs and GM products.

Out of different foodstuffs, soy and its production raised special environmental concerns (but many did not have an opinion, one disagreed). The respondents also point to the negative social implications that, according to them, have been faced in South-America. Environmental and social implications are viewed as closely related. Thus a respondent just refers to extending monocultures as an implication and source of risks.

Dissemination of information: product information through labelling

The respondents were in favour of the strengthening of labelling schemes (with the exception of the industry representative). An idea is presented according to which shops and markets should place potential GM products to a specific compartment.

Labelling of meat and egg products based on gm-feeds should be publicly deliberated, and Finland should promote this in the EU but some disagree (civil servant, industry representative, consumer association's representative), because the extension of labelling would increase costs and thus also prices, because separation of gm- and non-gm feed is expensive and hard to monitor.

Perceived role and behaviour of consumers

As it comes to the potential role of the consumers in the shaping of our techno-scientific futures, the answers diverged, too. The industry representative noted that minimisation of risks should not be left to the consumers because they make choices on the bases of their emotions. Consumers can be, and have been, manipulated not to make advantage of the new products (or to be disposed even to the idea of them).

A more common view was that consumers already have power to make a difference and that they should use that power. However, this should not mean that consumers carry responsibility over the minimisation of health and environmental impacts but the respondents remind that consumers can make choices only in the limits of existing assortments.

Regulatory challenges

No answers in Finland.

Public engagement and participation

According to the respondents, European stakeholders give adequate consideration to the points of the Finnish organisations and that they allow the opportunity to take part, but not all have an opinion on the matter. The representative of the consumers' association mentioned RTRS (Roundtable on responsible soy production) as an important arena for EU wide discussion.

5.3.5

Focus groups

This chapter summarises the results from the Finnish focus groups. While so doing it follows the structure familiar from the previous chapters. However, when comparing the results with those of the other countries it is important to acknowledge that the Finnish focus groups differed from the others in some respects. Hence the print-out of the imaginary nanotechnology website did not follow the same model in use in the other countries. Moreover, when signing in, the Finnish participants knew what the themes of the debates was to be (genetic engineering, nanotechnology).

Five focus groups were carried out in Helsinki between April and August 2011. Two of the groups discussed genetic engineering and three nanotechnology.

Litosseliti (2003: 1) describes focus groups as 'small structured groups with selected participants'. Compared to individual interviews, the key strength of the group approach lies in the communication and interaction they allow. Participants in these relatively small groups can hear what others think about the topic under discussion and raise points for deliberation by others. (Valve 2011) Focus groups generate qualitative datasets.

5.3.5.1

Participants in the focus groups

To four of the focus groups participants were recruited from a National Consumer Panel⁷². The fifth group, that of 'environmentally concerned' participants (another Finnish speciality), were recruited via mailing lists for students of environment-related degrees at the University of Helsinki as well as by contacting environmental NGOs.

Altogether 33 people participated in the groups. Participants' mean age was 52 years, ranging from 26 to 73 years of age. Half of them were females (16/33). Participants were mainly from the Helsinki metropolitan area, with the exception of 3 participants from Southern and Western Finland. Partici-

⁷² See http://www.ncrc.fi/en/research/consumer_panel/.

pants were mostly office employees or worked within welfare services. Many had undergone higher education. 8 out of the 33 participants were pensioners and 3 were students.

5.3.5.2

Response to focus groups

Irrespective of the theme, the focus group method was well perceived. We organisers were positively surprised by the intensity of the debates. The groups were generally committed to a broad and deliberative contemplation. However, it was not always that easy to follow the pre-given script: sometimes the strict structure and detailed questions annoyed the participants, too. Many topics separated in the script tended to be brought up at the same time: some many times. The role of the stimulation material was important. The participants were eager to learn more, asking many questions from the facilitator from the beginning onwards.

The nanotechnology groups were described as 'eye-opening' and 'interesting'. Participants seemed truly interested in the theme that was previously unfamiliar to most. Some participants had evidently read up on the topic in preparation for the focus group and this was reflected in their activeness in participation. Some participants saw that more participation from the part of the facilitators could have taken the discussion further.

In the GM groups, slight frustration was observable from some of the participants. The key criticism was the lack of information on the relevance of the focus group to the broader goals of the SEBEROC research project. Moreover, the participants felt that not all the questions were that relevant from a point of view of a Finnish consumer. Nevertheless, according to the most common evaluation the groups were 'quite interesting'. Gender roles played a distinctive role in the GMO groups, but not in a similar way in the nano groups.

5.3.5.3

Perception and knowledge of the technologies and the products

In all consumer groups the debate turned from intrinsic qualities of emerging technologies to the emerging techno-systems that may develop. According to dominant apprehension, innovations do not travel alone, but with various kinds of commercial and material arrangements. Cost and benefits were often claimed or suspected to result from emerging relationships. Such a view was powerfully expressed particularly in the GMO groups.

Genetic engineering and its products

In both groups the controversial nature of genetic engineering was acknowledged. Nevertheless the participants noted that the issue was not very intensively debated at the time of the discussion (in April 2011). Moreover, it was

common for them to wonder why are we exactly discussing the topic here today: are there GM products already on the market?

Gene technology was generally perceived as something unfamiliar. Some participants noted that it is unfamiliarity that raises fears and suspicions. For many participants the unfamiliarity, or the lack of sufficient, long-term scientific knowledge, is a reason to oppose gene technology – or at least to hesitate. However, at the same time in both groups it was claimed that the fears and suspicions are a result of deliberative manipulation. In other words, in both groups there was someone arguing that the opposition of gene technology is artificially mobilised by a conspiracy of some sort. These individuals emphasised that *in reality* there is nothing to worry about. There is simply nothing radically new about genetic engineering.

Whilst many participants intuitively took a position in favour or against GMOs, some (a minority) emphasised their lack of a determined view.

Monsanto and the problems related to its seed monopoly were spontaneously brought up in both GM group. Biotechnology businesses were blamed for causing problems in developing countries. The participants referred to emerging technological trajectories that allocate agency and freedoms in specific ways:

'Monsanto is fairly strict... in its seed selling. This might have... really far-reaching implications for small farmers, for example and I as a rule oppose such complete monopolies like the one towards which this Monsanto, if I understand correctly, drives at the moment'

However, a participant noted that the problems are not caused by gene technology per se, but by the misbehaving firms, continuing by saying that, on the contrary, gene technology might help to alleviate hunger and food shortages. This was responded by saying that it is not the lack of food that is a problem, but its uneven spread.

Soy was recognised as an important crop and food additive. Worries related to the use of gm-soy feed were spontaneously brought up (in both groups). The complexity of the labelling regulations entered the agenda already in this point. According to a participant the labelling of soy products such as tofu seems straight-forward, but are there non-labelled products on the market, too? She was told yes, if one wishes to eat pork products, the only way to avoid gm-soy is to choose organic options.

It was argued that problems related to soy production do not directly influence the Finns, but those who cultivate it in the poorer countries or are affected by this cultivation.

Nanotechnology and its products

Nanotechnology was an unfamiliar, "strange" field to most participants. This unfamiliarity resulted in statements illustrating wonder as well as fear and concern. Many participants referred to their lack of experience with nanotechnology. They also pointed to its incomprehensibility (small size of particles, not visible to the naked eye). Rapid emergence of nanotechnology was present in all focus groups.

Initial impressions focused on the costs and benefits of nanotechnology, combining promising opportunities as well as threats to human health and the environment. While some expressed an understanding of the duality /ambivalence of opportunities and threats, most responses considered only one of the two as an overriding argument either for or against nanotechnology;

[nanotechnology] probably has great opportunities for development

Some participants felt that a fear for nanotechnology was nothing more than ungrounded hysteria and aversion for the unknown, a typical reaction at the face of converging technologies.

A subset of participants approached the theme through personal experiences and anecdotes. These associations ranged from silver nitrate used in photography to socks, mittens and plasters employing nanosilver. In part nanotechnology was related to individual health concerns. One participant with diabetes feared the impact of nanosilver socks on his feet, while another began to suspect that nanotechnology had been employed in her asthma medication. Also the health of participants' families, of children in particular, was discussed.

Acceptability of nanotechnology captured the imagination of group 3 (consisting of actors assumed as especially concerned of nanotechnology) at an early stage in the discussion and continued to appear throughout the focus group. In other groups acceptability of nanotechnology was seen to be more dependent on the application in question. Applications with greater societal value (e.g. solar panels) were seen more acceptable than those aiming to enhance consumers' comfort.

In the consumer groups, only a minority of participants in groups had heard of **nanosilver** before. Those who had, associated nanosilver with existing products they had seen or purchased. Many were aware of nanosilver socks. Other products mentioned included nanosilver plasters, children's nanosilver mittens as well as sports attire. Some were aware of the antibacterial characteristic of nanosilver, while many remained confused about its function even after clarification. Risks to human health from nanosilver particles entering the bloodstream as well as agglomeration in the natural environment were viewed as prominent risks from nanosilver.

Comparison

In the nano groups the participants referred to their own experiences with nanoproducts. It was also recognised that the technology affects the qualities of consumer products. Paradoxically enough, nano thus became more a 'visible' topic: GMOs are, after all, hidden into production processes.

Moreover, the two categories of emerging technology were addressed very different kind of agency and future-shaping potentials. Only nanotechnology received 'path-opening' capacities and prospects. Meanwhile genetic engineering was mainly talked in terms of closure, making the technological applications to appear as devices that necessarily narrow down developmental options, hence creating almost suffocating path-dependence.

Many of the participants seemed to arrive to the GMO discussions with preset ideas. Arguments strictly for or against genetic modification were common and hence some level of polarisation among participants was identifiable. This was less the case on the nano side. With the exception of the 'concerned' actors (the third nano group), ambivalence characterised the discussions. In these groups the participants showed great interest in the theme, being eager to learn more.

Health and environmental concerns dominated in nano, and environmental and social issues in GMO groups. The specificity of food was recognised in both types of groups. Likewise, in all groups emerging technologies were discussed in terms of the potential benefits and of their likely distribution: at issue were not risks in isolation.

5.3.5.4

Purchasing criteria

The two focal products, chopping board and soy margarine, differed radically in terms of their importance to the focus group participants. Soy margarine is not sold in Finland, nor is such margarine generally used in food processing industry. However, imported products may contain soy margarine. Nevertheless only a minority of the participants claimed to actively buy any margarine: vegetable (rape and olive) oils and butter (or mixes of the two) are preferred instead.

Meanwhile chopping board was a product most participants found very important. Some of them evaluated it as an extremely important piece of equipment, whilst just a few told that they do not use a chopping board at all.

Conventional margarine and GM margarine

The participants voted the following qualities as most important criteria for buying foodstuff fats: taste; healthiness (dominating in one group); ethics (the products should be ecological, trustworthy, promote sustainable development, be of domestic production and not of multinational origin); versatility and, finally, the quality-price-ratio.

Majority of the participants would definitely not buy GM-margarine or other GM foodstuff fat (if it would be on the market). However, they could think for reasons for someone to do so, for example, due to the lower price of the product (the participants anticipated that GM production may be more productive) or due to the potential new nutritional qualities the margarine might have. Making of the list of the reasons for not buying proved, nevertheless, easier. The participant's noted that price is not necessarily the key purchasing criterion, the concerns already mentioned matter as well (particularly the poor ethics of big multinationals operating in biotechnology business). For some, uncertainty would also be a reason to avoid a GM product. One respondent noted that he does not use any margarine because they are usually produced by big multinational companies such as Unilever.

It was also possible to identify some very dogmatic opinions. According to one view gene technology represents unnaturalness and human attempts to mess with nature. Therefore, it is something ultimately negative and acceptable in no circumstances. However, a similar, but opposite point was also made, stating that all worries and suspicions are necessarily irrational and purely emotional. From this line of thinking it also follows that deliberation is useless. Since the discussion would have no rational bases, no space for reasoning would exist.

Conventional chopping boards and nano-silver chopping boards

The participants viewed easy clean-ability as the most crucial quality of a chopping board. Almost as important is the durability of the material. However, the material should not make the knife dull. Furthermore, a shopping board should be of appropriate size, harmless to health, hygienic, unable to release materials and good for its purpose.

Almost all participants agreed that for a larger sample of the Finnish population, price would be an important criterion (in our groups price got only one vote). In one of the groups it was estimated that for the broader public the antibacterial characteristic of nanosilver was likely to appear as a positive feature. In another group it was noted that a chopping board coated with nanosilver could be aesthetically appealing and that even a high-tech, luxury brand could ensue. Or perhaps an odourless chopping board could be appealing to many?

Otherwise the participants felt that the list of criteria they valued, including many reasons for not buying a nano-silver chopping board, was likely to be representative of the views of the average consumer.

'A chopping board is no high-tech product - -. What else could anyone think of?'

Many would not purchase a product that employs an unfamiliar technology which they do not understand. Besides, most participants felt that they do not

need an antibacterial chopping board as they manage very well with a traditional one. For some an antibacterial chopping board seemed unnatural, unnecessary and even dangerous. In any case, a silver-coated version might turn out more expensive than a traditional one. Finally, and importantly, such a product was associated with food. The potential risks of nanotechnology made the product seem off-putting;

'It is food after all what we are dealing with'

Comparison

Regardless of the theme of a focus group, the importance of the modified product under discussion (GM- margarine, nanosilver chopping board) was perceived as low. Therefore the general view was reserved: people were not ready to buy these products. Particularly in the nanotechnology groups this was not just the possible risks, or the existing uncertainty, but the relationship of the two to the consumer benefits. Hence self-cleaning windows received considerable interest: those would be useful indeed.

However, in all groups there tended to be dissidents who claimed, in a way or another, that it is unnecessary to be prejudiced against new technologies. In part these participants might have been provoked to break the consensus, but some of them were also passionate to express their positive opinions from the start.

5.3.5.5

Consumer information

Labels: GM-free label and nano-product label

There are no 'GM free' labels in margarines in Finland, but for a while the main milk refiner marked their milk cartons with a GM-free label. Some of the participants had noticed it. In addition, one participant had also come across such a claim in another soy product.

None of the participants had seen a nano label before but one participant had encountered the word 'nano' in relation to a product.

Many of the participants were sceptical about GM free labels. Impulsively they viewed such labels as purely marketing and brand-making devices. The label is unnecessary: there is no gm-milk, for example, on the market anyway. In one of the groups it was also asked that if some products would have a GM free label, would that mean that all the rest (not labelled) would not be GM free?

Moreover, the labelling of meat and egg products produced with the help of *GM-feed* raised vivid discussion. Hence a participant wondered that if there would be 'GM free' labels, would that imply that transgenics have not been used in the entire production process? That chicken, for example, have not eaten gm-feed? No, replied another participant, she would not interpret the

label to mean that. But it was also argued that to know about the whole production process would be important, just as it is important to know that a product is not manufactured with the help of child labour. However, practical problems related to the controlling and monitoring of production processes were recognised.

In all groups labelling was viewed as a complex issue that would not *alone* suffice as a communication device or a policy instrument. From the point of communication, doubts were raised about visibility and clarity. So if something is to become labelled, the signs should be big and clear. However, in any case there is a risk that we would end up having too many labels:

'if each and every product must have some kind of a label in the cover, the cover will be full be images... that this does not contain this and neither this – that there should be some limit'

Of course, labels should be trustable in order to communicate effectively. This raised questions about their institutional basis. Unofficial, non-authorised labels would be difficult to trust. Existing labelling schemes suggest that criteria-setting is problematic (e.g. FSC label); similar fears were expressed with regards to nano labelling.

However, despite of these restrictions, labels were also widely recognised as something potentially useful, helping consumers to make informed choices. In a GM groups a common view was that the current practice outstrips one that would be based on GM-free label. Nevertheless a GM-free label might have some influence. At least the majority view was that a GM-free alternative would be preferable compared to one that is not. But some nevertheless argued that price and quality have more influence than a label.

Labelling of nanoproducts was generally considered important. It was noted that a label could be realised relatively easily and would raise awareness and interest in nanotechnology. But many participants of the nano groups thought that to buy the labelled nano product (and make an informed choice) they would require more information. However, even though the majority would not imagine buying nano products, both groups had some participants potentially willing to do so.

I might buy one, because I like to try out new products, but ... not, if I did not know what it means. So either I would go back home to google, or alternatively I'd turn over the packet to see if there is a more comprehensive description. But I'd be interested.

The relationship between labelling schemes and risk regulation raised debate in almost all groups. In the GM groups it was noted that labels could be misleading, indicating that GMOs are harmful. If this is not the case, no labels will be needed. Likewise, in the environmentalists' nano group it was argued that nanolabels might have what the participant saw as an unintended impact:

consumers might associate a nano label as a positive feature. According to this view, in order to avoid misleading consumers, labels must be clear on whether their message is a positive or cautionary one. In other words, labels were assumed always to have a strong normative message.

One of the environmentalists saw the practice of labelling to legitimise an unjust structure where one could choose whether to buy environmentally or socially unsustainable products. Ideally, no such products should be allowed to enter the markets. This would remove the need for labelling schemes. Building up on this argument, another participant argued that the practice of labelling should be abolished as it gives the individual disproportionate power. The main supporting argument was the externality issue – an unfair situation ensues when one can decide to buy an environmentally unfriendly or socially unjust product, enjoy the benefits of consuming it and paying a lower price for it, while the society bears the costs. Due to the nature of environmental problems, decisions of this magnitude should not be made by the individual, but by our democratic system in place. Distinctive to such a view is the neglect of uncertainty and ambivalence. Just like the extreme technology advocates, the extreme critics viewed emerging technologies as fully knowable. Likewise, in both options, little room or rationale was left to labels and to consumer choice.

On the other hand, even in the group dominated by the environmental activists, most participants opposed to the stance that labels should not exist. However, they should complement authorities' testing and monitoring. It was also noted that the GMO experience supports labelling of nanomaterials. Even if the authorities were to find them safe, similarly to GMOs, a considerable amount of consumers would prefer to be made aware of their presence in order not to purchase nano products. Testing, no matter how extensive, is not able to ensure product safety perpetually. So, according to this view, a degree of uncertainty will always prevail.

In other groups, too, participants emphasized how consumption choices are made on the basis of values and ethics of the individual. A "grey area" will prevail as consumers will never agree on the ethicality of a range of products. Labels are a way of bringing information to consumers within this grey area. Moreover, low trust in authorities supports voluntary labelling even though consumers cannot be responsible for everything. Hence most participants warmly welcomed the idea of a nano-label. However, labels would hardly work alone. Special communication efforts should accompany. The setting up of a nano fair or a national nano week was suggested. Collaboration with producers could enable tangible introduction of nanotechnology applications to consumers. One of the participants saw that before communication, authorities must produce information on what is currently known and not-known about nanotechnology.

More detailed product information

Not applicable.

Website information

In the Finnish focus groups we circulated print-outs of imaginary websites, containing information of GM-soy obtained from the GM-Compass sites and from Finnish papers providing information about the potential environmental benefits and risks of nanomaterials and of nanosilver in particular.

In the GM groups, the first reactions to the text varied a great deal. Some of the participants noted that they learned little new from the print-out, whilst one of them claimed that some points were earth-shaking (referring to knowledge on the scale of GM-soy production and use). In the other group the print-out clearly affected deliberation. New worries, echoing the content of the print-out were raised.

'One just wonders'

Common concerns related to the fact that most GM soy is herbicide resistant and that this resistance may increase the use of herbicides. It was noted that such development may have adverse impact on biodiversity. Moreover, what if the herbicide cumulates into soil and what if traces of it end up into our food system?

However, one participant noted that although erosion and biodiversity losses raise concern, side-effects are an essential part of human activities. According to a similar, but more conciliatory response, something obviously should be done to the harms, but this would not require abandonment of gene technology.

In the other group the text brought up, again, issues of global justice and fairness. Several of the participants viewed gene technology as an instrument of exploitation. It was also pointed that only few of the new traits alleviate famine. Concerns were also raised about the occupational safety of the third-world employees. But these views were responded by a participant who suggested that more attention should be put to the EU farming subsidies that keep world prizes of foodstuff resources artificially low. Likewise the development of logistics and transport systems in third world countries was perceived as important.

Co-existence between GM and non-GM crops also received special attention. Several participants suspected that co-existence might not work in practice. A discussant warned about the risks of monocultures. She also noted that dependence on one seed selling company may cause problems to the farmers.

A number of people stated that the paper strengthened their views: they would not buy products containing transgenic components. But some also

stated that purchasing decisions must be done by case-by-case basis: they were reluctant to say anything definitive.

In the nano groups the print-out embarked interesting debates, too. Some participants pointed to the potential of applications to solve environmental problems, but it was also noted that many of the currently available applications are nevertheless useless in that respect. Even their significance and benefits to consumers were questioned:

'To whose benefit is it [nanotechnology] anyway? Is it to the consumer's benefit? Or is it to the producer's?'

The information provided seemed to give more reason for concern on nanotechnology. The lack of information and certainty on impacts on human health and the environment became a re-enforced reason for avoiding nanotechnology. A threatening picture of the rapid emergence of nanotechnology appeared. Profit-making was seen as the main consideration in the absence of experience and adequate testing.

'It seems that we are going forward so fast with nanotechnology that it must be money that has the final say here.'

One of the participants saw a worrying analogy between nanotechnology and the tobacco industry.

'Are we waiting that someone gets cancer before we act?'

All focus groups saw authorities too static and slow as actors to effectively address nanotechnology;

Many participants were surprised by the lack of safety regulation and were worried by the situation;

'I'm just thinking how can this be possible? Half of this text is just like, well these products are on the market, no conclusive research results. Every single issue like this, like GMOs for example, is taken up by an ENGO. But this... it has entered the market without any EU legislation and even this REACH regulation here doesn't seem to be up to its task.'

The problems related to waste management were new to most participants. To many the topic was of great concern. First, the participants wondered how would the recycling of nanomaterials work in practice? Second, parallels were drawn between the release of nanosilver into waste water and medication (antibiotics, contraceptive pills (EDCs)) released into waste water after going through human metabolism.

In all the groups there were participants claiming that they probably would visit websites similar to the imaginary one. In the nano groups this was argued to hold particularly if they were considering buying a nano product. Participants were also more likely to visit the website in the case that the product

they were about to purchase was an expensive one. Many were especially interested in such a website due to the focus group discussion.

'Before this I wouldn't have even paid attention to the issue but now yes.'

However, some doubted both their own and others' enthusiasm in reading up on the issue.

'I don't think I'd have the energy to read this stuff just for fun.'

'Maybe I would but I'd definitely be in the minority. There's so many other factors to take into account too, carbon footprint, water footprint. 99.9% of consumers wouldn't bother.'

Similar views were expressed in the GM groups, too:

'I might visit...but I do not—in detail, it is impossible for an individual to chase up everything. There are so many things which one has no time to chase up... so I do not feel myself inadequate. In the world I need to rely on many things, either to some norms or laws or something, because no-one's human resources are sufficient... for forming of opinions – one just needs to trust that this house will not fall down to us. I view food production in a same way... I feel that is up to legal regulation... and ethical and healthy enough food is being sold here, so that the consumer does not need to peer every pot... so would I buy this or that.'

On the whole, internet was viewed as an important source of information. However, it was widely recognised that one needs to do some surfing, to read critically and to actively compare different sources.

Comparison

Emerging technologies were commonly discussed in terms of unfamiliarity, strangeness, and also as something secretly emerging and encroaching. Perhaps therefore labels were mainly debated in positive terms. Labelling of products produced with the help of GM feed was also viewed desirable. However, the GM-free label raised clear suspicions.

Most participants were strongly against the idea of buying GM-products. However, in both groups it was marked that labelled GM products would come across only abroad. Throughout the discussions ambivalence was a cross-cutting theme, materialising in questions about who to trust and how to influence.

A precautionary attitude towards emerging technologies seemed to dominate in all focus groups. In some cases the stimulus material resulted to reconsideration of the originally less hesitant and more positive views. However, it was also common for both nano and GMO groups that some participants hold their specific standpoints from the beginning to the end, perhaps even repeating some arguments from time to time. This was true particularly for the advocates of conspiracy/manipulation theories in the GMO groups.

Despite of the interest and discussion the imaginary websites sparked, in all groups the ideal on a constantly alert and interested consumer caused some distress. In the nano groups, visiting of websites was more clearly linked to purchasing decisions. A common message from the discussions was that people seldom visit websites, but rather think of the web as a whole. Information from one site must be compared to what is found from other ones.

The most tangible and widespread suggestion to bring order to the governance of nanotechnology was the labelling of nanomaterials, as all participants agreed that labels should complement authorities' testing and monitoring. For the time being, nanotechnology and its environmental and health impacts remain within an uncertain "grey area". It therefore seems that labels, while perceived far from a perfect, can capture some of the persistent uncertainties currently inherent to nanotechnology and perhaps portray some of the different shades of grey to the consumer.

Labels were often addressed capacities as devices that allow consumers to relate to uncertainty and ambivalence and – in the case of GM soy – to a production mode. However, some participants, irrespective of the specific technologies under debate, viewed labels as a priori questionable or even harmful. In the nano case it was stated that a label could be read as sign of all-embracing consumer responsibility: it would be up to individual citizens to decide what risks a society would take. Meanwhile in GMO case points were made, in a sense, about the opposite: consumers, due to psychological reasons, would disregard products with labels ('is produced with/contains transgenics') 'in vain', just on 'irrational' and emotional reasons.

5.3.5.6

Responsibility of actors

Across the focus groups consumers were addressed much responsibility:

'One cannot live just thinking that the Big Brother has done all choices on the behalf of us'

However, it was doubted that consumers are willing to take such an active role they should. Moreover, consumers' responsibility should not be away from the public government. So whilst it was common to talk about *division* of responsibilities, in the focus group responsibility did not necessarily take a shape of a 'cake' that would diminish when distributed.

Hence, in the GM groups, claims of consumer responsibility circulated with reminders of the obligations that civil servants and decision-makers have. They should guarantee that GMOs do not disperse uncontrollably to the nature. In the GM groups little trust was addressed to the private sector.

The European Union was addressed responsibility, too. EU could act as pioneer in the field of biosafety: it is easier here, in the well-off parts of the world, to pay attention to environmental protection and also demand it from

the trade partners (such as US, China). Meanwhile Finland should become a pioneer in organic production and make use of its national sovereignty in GM issues.

Public authorities, NGOs, specific journals and magazines and scientists were named as particularly good sources of information over gene technology (even web pages of private companies were mentioned once). However, the trustfulness of NGO information was contested: for one person the input is particularly valuable (*'they bring about discordant notes'*) whilst another claimed that these organisations are unreliable.

All participants in the nano groups agreed that the authorities' control over nanotechnology was limited and to the shock and distress of many, regulation was seen to be lagging behind. Many found that in the presence of scarce resources and considerable uncertainty, authorities are no longer able to cope with the extensive information and testing requirements imposed by the new technology. No golden bullet for this dilemma was articulated – some called for more public resources for the authorities, others encouraged collaboration with the private sector. The claim for more research was a more cross-cutting theme.

The most tangible and widespread suggestion to develop governance of nanotechnology was the labelling of nanomaterials, as all participants agreed that labels should complement authorities' testing and monitoring. For the time being, nanotechnology and its environmental and health impacts remain within an uncertain "grey area". However, this was seen as no excuse for not informing and communicating. The participants called for transparency and balanced information communication from authorities and producers on the advantages and disadvantages of nanotechnology. However, at the time it was consumer responsibility was, again, emphasised. Consumers should to take initiative and to actively search for information.

Authorities were encouraged to cooperate with producers in the testing and regulating of nanotechnology. This could be especially valuable to authorities often lacking the correct equipment and methods. Inclusion of nanomaterials within the REACH regulation was of utmost importance to one of the participants. Finally, it was argued that states need to take a greater role in shaping nanotechnology development into a direction that will benefit society the most. If development is left to the private sector, it is likely to focus in products aimed at the middle classes instead of products yielding societal good. Development should aim for patents of socially valuable applications, executed in cooperation with public universities and research institutes.

A cross-sectional topic related to the diverse perceptions the participants had on the overall controllability of technological development: the views varied from human omnipotence to technological determinism. Hence in both types of groups arguments could be rather hopeless, presenting technologies and

their risks as something that unavoidably materialise – or as something that can be kept under public control. In a similar way also views on knowledge and uncertainty fluctuated. Whilst some participants had very optimistic views on the potentials of science and scientific research to provide ultimate truths, others were more doubtful. As discussed above, these differences were reflected to the ways people perceived the role of labels and labelling. The labels were seen as a means to create a relationship to technological development and to the necessary uncertainties it entails.

The list of potentially good sources of nanotechnology information proved long. Again the trustfulness of the producers became contested. Meanwhile quite a lot was expected from authorities such as ECHA and the Finnish Ministry of the Environment. However, there was some concern for the authorities for being slow and too susceptible to lobbying. Researchers and the scientific community were perceived as a reliable source. Finally, consumer associations and environmental NGOs were named as likely sources of good information.

5.4

The Netherlands

This chapter provides an overview of the results of the empirical work in the Netherlands. It aims to summarize the results of the two case-studies (nano and GMO) in each thematic section.

5.4.1

Regulatory frameworks

5.4.1.1

GMO

In the Netherlands, provisions for the use of GMOs are laid down in a GMO Decree and a Ministerial Regulation based on the General Environmental Management Act (Besluit genetisch gemodificeerde organismen milieubeheer en Regeling genetisch gemodificeerde organismen). Directive 2001/18/EC (on the deliberate release of GMOs into the environment) and Directive 2009/41/EC (on the contained use of GMOs) are implemented in these regulations. There is a permit system for contained use and for the introduction into the environment of GMOs. On behalf of the Minister of Infrastructure and the Environment, the GMO Bureau (Bureau GGM) of the RIVM, carries out the permit system.⁷³

Compared to some other Member States, the Netherlands has very strict conditions for the use of the label 'bereid zonder gentechniek' (produced without gene technology). Since 1999 these conditions are laid down in the 'Com-

73

modities Act Decree on novel foods' (art. 3a).⁷⁴ The label is only allowed for food and drink commodities which:

- do not exist of, or are not derived from GMOs, and
- are not prepared with substances which exist of, or are derived from GMOs, or which are produced with ancillary process materials derived from GMOs;
- are not derived from animals fed with GM feed or feed containing GM additives, or animals which had drugs produced with modern biotechnology, unless alternative drugs do not exist; neither from animals with traces of DNA unless this is adventitious and technically unavoidable.

Documents are required to prove that the requirements are fulfilled (art. 3a section 1 and 2). Other labels (e.g. 'GMO-free') are explicitly *not* allowed (art. 3a section 3).⁷⁵ The label 'produced without gene technology' is incidentally spotted.⁷⁶ No governmental or self regulating activities have been developed to apply this 'produced without gene technique' label.⁷⁷ Although there is no specific legislation about the discretionary power of Member States on this aspect, the Dutch legislator assumes that within EU legislation Member States have room to lay down these specific rules for products made without gene technology.⁷⁸

In 2009 and 2010 a discussion took place in the form of litigation, between Greenpeace Netherlands and the Dutch Minister of Agriculture, about the interpretation of the 0.9% contamination threshold in Regulations 1829/2003

⁷⁴ Warenwetbesluit Nieuwe Voedingsmiddelen 29 April 1997 (amended). The Decree is based on Directive 258/97 and on the regulations 1829/2003 and 1830/2003. In 2000 politicians and stakeholder organisations stated that these requirements can hardly be applied because of their strictness (De Vriend, ongedateerd).(H.C. de Vriend, *GGO-vrije additieven en hulpstoffen voor biologische (dier-)voeding*, ongedateerd,p.9 (www.lisconsult.nl)).

⁷⁵ A general labelling Decree prohibits the use of this specific labelling in a situation where all products are produced without gene technique (Warenwetbesluit etikettering van levensmiddelen, Art. 29 section 2).

⁷⁶ An example are the organic products of Taifun, Life Food (Freiburg) with a 'bereid zonder gentechniek' label and referring to: www.taifun-tofu.com.

⁷⁷ In the explanatory memorandum of the above mentioned Decree the application of such a scheme, e.g. a certification system, is left to the market. In the conventional agriculture some initiatives were started to have a chain free from GMO, but these initiatives did not continue (e.g. Kwetters eggs).

⁷⁸ The explanatory memorandum of the Decree (Warenwetbesluit Nieuwe voedingsmiddelen), p. 3, refers to the repealed regulation 1139/98 (preliminary considerations no. 20), where discretionary power for the Member State on this subject is explicitly mentioned)and is not considered to be conflicting with regulation 258/97/EC.

and 1830/2003. The interpretation of the Minister until then had been rather broad. In the appeals phase before a Dutch administrative court the Minister of Agriculture replaced an earlier decision by a new decision, admitting that the contamination up to 0,9% is only permitted when the contamination is not 'unadventitious or technically unavoidable'.⁷⁹ This means that these conditions have to be weighed.

5.4.1.2

Nano

There are no specific regulations or provisions on nanomaterials in the Netherlands. Although several advisory councils concluded that there should be some form of regulation of the marketing of nanomaterials (e.g. VWA 2008), to date no national regulatory initiatives have been taken.

In 2009 three ministries (environment, public health and social affairs) commissioned an extensive research project concerning the appropriateness of existing legislation for regulating nanomaterials. The study, conducted by the University of Amsterdam, analyses possibilities and bottlenecks for regulating uncertain risks of nanomaterials in the fields of environmental protection, consumer protection and safety at work, at the EU and national level (Vogelezang-Stoute et al. 2010).

A central research question of this study was what regulatory powers authorities have to regulate the production, marketing, use and the waste phase of nanomaterials (e.g. to require notification, delivery of data, labeling or to take restricting measures) and what obligations industry and employers have. The study identifies many gaps and obstacles for regulating nanomaterials in the existing EU and national legislation. One of the conclusions of the study is that Member States do have discretionary powers to take national measures as long as EU legislation does not exhaustively or effectively regulate the marketing and use of nanomaterials.

Beginning 2011, in a policy letter to Parliament, concerning the national strategy for handling uncertain risks of nanomaterials, the ministers refer to this study as an element of this strategy. No regulatory action was taken, however. On the one hand there is a growing support for national measures, such as notification, because of the slow progress in EU regulatory developments. On the other hand, the ministers still prefer an EU approach and therefore refer to the coming EU Environment Council, June 2011, for steps to be taken (Policy letter, 2011).

Dutch authorities have urged the Commission to come with a definition before the mid 2011 meeting and to conclude the three REACH (RIP) projects.

⁷⁹ Ministry of Agriculture, May 18 2010, DRR&R/2010/4101.

The Dutch authority is preparing the evaluation of a nanomaterial under REACH (not to start until 2012 however (ChemicalWatch, 9-3-2011)).

Parliament, however, requires action, insisting on a notification scheme for nanomaterials. The discussion between Parliament and the ministers, about a notification scheme, is to be continued (Report Parliamentary meeting, 2011). Although the sharing of information is a central theme in the government strategy, the ministers conclude, in a letter to Parliament, that attempts have failed to attain a covenant with industry to share nano information (Policy letter, 2011). To date in the Netherlands there are no covenants or other voluntary agreements in the field of marketing and use of nanomaterials.

5.4.2

Market situations

5.4.2.1

GMO

Although GM crops are not commercially cultivated in the Netherlands, a voluntary agreement on coexistence guidelines was developed by the relevant parties in 2004 and an experiment was carried out in 2006 and 2007 to test isolation distances.⁸⁰ The Netherlands is one of the biggest importers of soy beans and soybean oil (FAOStat 2011). Much of this is for feed in the intensive farming industry. According to a calculation for soy in the Netherlands, in 2008 and 2009 yearly a total of 1.8 mln tonnes of soy products are consumed in livestock feed and 0.13 mln tonnes (primarily oil) in human and technical applications. The total area of cultivated land required to produce this quantity of soy is approximately 700,000 ha. Around 80-90% of the soy import comes from South America. Part of the soy import (beans, meal and oil) is directly shipped to other countries. Part of the soy which is processed in the Netherlands is also exported. The soy is used for livestock feed and in human (food) products and technical applications (Hoste en Bolhuis 2010). Another source calculates that the processing of soy for food and feed is 3,3 mln tonnes in 2008, some of which is exported. Only 4% of this is categorised as 'responsible', which, among other things, means this is GM free (Soja Barometer 2009).⁸¹

Specific for the Netherlands is that several GM soy food products labelled as 'geproduceerd met genetisch gemodificeerde sojaolie'(produced with GM soy oil) are on the market, such as: salad oil and margarine from GM soy beans.

⁸⁰ See Coëxistentie gg-gewassen, conventionele en biologische gewassen, Kamerstukken II 2004/05, 29 404, nr. 6.

⁸¹ Standards of ProTerra biologisch and EcoSocial are used.

The GMO compass mentions the Netherlands as a notable exception for products with a GM label.⁸²

There is no public register of these products. According to Greenpeace some 17 GM labelled food products (mainly based on GM soy oil and GM maize (crisps)) are available in supermarkets.⁸³ The number of GM products dropped after the GMO labelling requirements became applicable, in 2004. The GM labelled products seem to be the cheaper products within their segment.

5.4.2.2

Nano

As far as we know there are no statistics or calculations publicly available about production, handling, import or export of nanomaterials in the Netherlands. Nanotechnology is one of the high tech priorities of the Dutch government and industry. There are ambitious Research & Development and innovation programmes. An example is NanoNed, a network of universities, TNO and Philips.⁸⁴

Nano particles in consumer products: There is no database of marketed nano-products. The following three reports give some idea about nano (claims) in certain product categories on the Dutch market:

2009: Inventory of consumer products (non food) with a nano-claim: 120 products, of which: cosmetics 70; cleaning and maintenance 45; other (textiles, lunchbox) 5. Surveyed market segments: cosmetics, cleaning products, textiles, food contact materials, biocides (VWA 2010).

2007: Inventory of consumer products (non food) with nano-claim: 120 products (main categories: cleaning products, cosmetics, clothing). Surveyed market segments: kitchen and bathroom appliances, electronics, home furnishing & household products, motor vehicles, food packaging, personal care & cosmetics, health, sporting goods, textile, toys & games, cross-cutting, miscellaneous (RIVM 2007a).

2007: Inventory of nanomaterials (NMs) in the food chain, not specific Dutch market: among other products: pesticides, food processing and storage and

⁸² See www.gmo-compass.org/eng/regulation/labelling/: The site shows several illustrations of GM labelled products.

⁸³ www.greenpeace.nl/campaigns/gentech/waar-vind-je-gentech.

⁸⁴ In 2009 e.g. 125 million was granted to the programme 'Towards a sustainable open innovation ecosystem' (new applications for nano- and microtechnology); 28 million to NanoLabNL and 12 million to CAT-AgroFood Wageningen. In the period 2006-2012 the Innovation Programme Point One was granted 343 million. A nanotech multi annual programme is NanoNed (95 million), 2005-2010). See www.rijksoverheid.nl/onderwerpen/nanotechnologie ('investeren in onderzoek').

food packaging (RIVM 2007b). Some 10 applications of nano-silver in food processing and storage were identified.

In 2010 a debate took place between the Dutch Consumer Organisation (Consumentenbond) and the Dutch Food Industry Association about nanosilica in food products, such as coffee creamers.⁸⁵ A study of the government research institute for public health and the environment, RIVM, brought this on the public agenda (RIVM 2010). New research results are expected in 2011.

Nano-silver products on the Dutch market: A 2009 inventory identifies the following product categories: cosmetics and personal care: 4, textiles: 3, food packaging box: 1 product. Products mentioned are: Nano-Silver hand sanitizer, Nivea anti-transpirant Silver protect 24h, tooth brush Aquafresh, X socks air force 1 silver, Trekking TK short coll (sportswear), Odlo sports underwear windproof shirt, Crystal colloidal silver (cosmetics), Freshbox, nanosilver food container.⁸⁶

In 2010 and 2011 several supermarkets/warehouses sell socks labelled as: 'Feel Fresh, antibacterial finish, helping your feet feeling fresh and odourless'.

According to several detailed surveys on opinions of consumers regarding nanotechnology and nanoproducts, the awareness and the opinions of consumers about nanomaterials depend on the product category and the products. E.g. for personal care products eight out of ten respondents do not know whether they use products with nanomaterials (n = 481). The advantage of nano-anti-wrinkle cream is the best known, advantage of nano toothpaste is the least well known. Of the respondents 21% is positive about further development of nano personal care products. In an earlier survey this was 28%. For food products: nine out of ten respondents do not know whether they use food for which nanotechnology is used (n = 517) (Nanopodium 2010, p. 45-51).

5.4.3

Public debates

5.4.3.1

GMO

In the Netherlands, there has been a public debate about GM in the year 2002. This debate, organized by the Terlouw Commission, was criticized by several NGOs, including Greenpeace, because it did not address the fundamental question whether gene technology is desirable and necessary at all.

⁸⁵ See:<http://www.consumentenbond.nl/actueel/nieuws/nieuwsoverzicht-2010/duidelijkheid-over-nanodeeltjes-snel-nodig>.

⁸⁶ Several of these products do not have an explicit nano claim.

Several later attempts to put this question on the political agenda were not successful. At a recent meeting, organized by the Dutch Minister of Agriculture, the Minister mentioned that, in her opinion, the question “do we want GMOs?” was no longer relevant, because many GMOs are used already in feed, cotton and other products (NRC Handelsblad, June 10, 2009).

In 2010/2011, there is not much national debate. This does not mean there are no developments. In Parliament the authorisation of the Amflora potato raised some discussion in 2010 (Parliamentary letter 25-5-2010).

At the policy and advice level the GMO advisory commission for the government (COGEM) in 2010 published an important report ‘Geboeid door keuzevrijheid’, about developments regarding freedom of choice in relation to GMOs. Five labelling scenarios are sketched: 1. obligatory positive labelling (current situation), 2. voluntary negative labelling (GMO free), 3. pollution label (traces of GMOs), 4. restructuring the label information and 5. framing labelling in another way (COGEM 2010, in Dutch).

In 2009 the COGEM published the report ‘*Should EU Legislation Be Updated; Scientific developments throw new light on the process and product approaches*’. A conclusion is that the GMO legislation is no longer in step with scientific developments in plant biology. As a result it is no longer clear what should be considered to be a GMO. The ‘process based’ EU legislation creates an uneven playing field compared to the US system, and undermines consumer choices. This calls for a rethink of the EU legislation, according to the COGEM conclusions (CGM/090626-03).

Field trials are being conducted regularly and there is an extensive case law of the Administrative Court of the Dutch Council of State (more than 50 cases) concerning these field trials (for maize, potatoes, apple trees, poplars and rapeseed). Many permit decisions were annulled by the Court, often because of a lack of information about the locations of the trial, but also because of risk assessment and permit procedures.⁸⁷ In many cases NGOs are an appellant party.

As far as the caselaw concerns, after several successes in the years before, in 2010 Greenpeace and the organic farmer’s association lost a court case against the minister of the Environment about field trials.

According to the Administrative Court the permit meets the requirements of Directive 2001/18. The risk for the organic farmers for contamination (cross breeding) did not have to be taken into account in the decision for the permit for category 2 and category 3 field trials, the Court argued (ABRvS 28 April 2010, 200802711/1M1).

⁸⁷ For an evaluation of the court cases see: Somsen, 2010 (in Dutch).

According to this decision less information for third parties will be required about the field trials.

5.4.3.2

Nano

Since 2007 the government has laid down its policy on nanotechnology in a Cabinets vision on nanotechnologies (Kabinetsvisie Nanotechnologie 2007), an Action Plan Nanotechnology (Actieplan Nanotechnologie 2008), and several policy letters to Parliament (e.g. Policy letter 2008). Via subsidy schemes Research and Development and Innovation are stimulated (Actionplan nanotechnology, progress report).

In 2009 Parliamentary resolutions required the government to:

- accelerate the development of risk analysis of nanomaterials,
- introduce a notification obligation for the use of nanomaterials, and
- develop nano reference standards for industry (see RIVM 2010b).

In the meantime the government has announced that a minimum of 15% of the nano research budget will be used for nano risk research (Policy letter 2011). One of the government actions was the founding of a 'Kennis- en Informatiepunt risico's nanotechnologie' (Knowledge and Information Point for nanotechnology risks) within the RIVM.⁸⁸ Interim nano reference standards have been developed in 2010. Further research is being done on these standards (Dekkers 2010). The government policy on notification is to try to establish a notification scheme at the EU level (Policy letters 2009 and 2010. The EU Environment Council in June 2011 will discuss this issue. However, options for regulatory action at the national level are being considered in case the EU route might take too much time (Policy letter 2011, p. 7-8).

Advisory reports of the Health council, the Social and economic council, and the Office for risk assessment (food and products), all recommended a precautionary approach for the marketing and use of nanomaterials:

- The Health Council of the Netherlands concluded that investigation of toxicological properties of not readily degradable or dissolvable nanoparticles should be done before mass production and marketing (Gezondheidsraad 2006).
- The Social and Economic Council had as main conclusions that the employer bears main responsibility and that substances with uncertain or unknown risks – including nanoparticles – should be treated as hazardous (or extremely hazardous) substances. Policy and implemen-

⁸⁸ http://www.rivm.nl/rvs/075_nanotechnologie/KIR_nano/. The tasks of KIR nano are to identify risks, to advise and inform ministries and parliament and to participate in international and EU committees.

tation measures should focus on preventing or minimizing exposure of employees (SER 2009).

- The Risk assessment office of the Food and Consumer Safety Product Authority in 2008 recommends that notification of the presence of nanomaterials should be required (VWA 2008). For food products one of the recommendations is that food products with deliberately produced nanomaterials should be treated as novel products (VWA 2010).

Since 2003 the Rathenau Institute, an institute for research and debate on science and technology, works on stimulating a dialogue about nanotechnology, between science, government, industry and community. One of its publications, based on workshops with Dutch NGOs is 'Ten lessons for a nanodialogue' (2008). One of the Rathenau activities was to prepare materials for round tables for parliamentary commissions in 2009 (Rathenau 2009). In 2009 a survey under 550 consumers showed that 58% of the respondents had never heard of nanotechnology (LVN Consumentenplatform 2009).

In 2009 and 2010 a big 'Nanodialogue' took place, organised by the Commission Societal Dialogue Nanotechnology. This raised quite a lot of publicity and debate. Many events were organised, projects were subsidised and surveys carried out (Nanopodium 2011). Many different activities were financed (nano cafés, dialogues, websites, television, school projects and other educational and communication projects). Next to NGOs, such as WECF (project: Nano in the babyroom) and the Society for Nature and Environment, universities, churches and other organizations participated). The Commission uses the 'virtual arena' NanoPodium⁸⁹ for all the activities (Tussenrapportage 2010). One of the results of the activities seems to be that nanomaterials have been in the news quite often in 2010 and that awareness has grown in the general public. In 2009 54% had heard of nanomaterials, in 2010 this was 64% (Nanopodium 2009 and 2010). Research results about nanomaterials in food products (RIVM 2010) also contributed to bringing nanomaterials in the media and on the public agenda.

In the Consultative group of nano stakeholders of the ministry of the Environment (Klankbordgroep nanorisico's), in which representatives of NGOs (environment and consumer organisations and business and industry organisations) participate, one of the discussion points is a covenant about sharing information about (risks of) nanomaterials. However, in the 2011 policy letter the Minister concludes a covenant could not be attained due to restraint regarding sharing confidential information (Policy letter, 2011).

In 2010 opinions and experiences of CSOs (civil society organisations) with voluntary codes, measures and practices were investigated. This project aimed at developing a framework to support the successful integration and imple-

⁸⁹ www.nanopodium.nl.

mentation of an EU Code of Conduct (CoC) for nanosciences and nanotechnologies, as proposed by the European Commission in 2008 (<http://www.nanocode.eu>). The report of this project contains some interesting observations:

- The multi stakeholder dialogue workshop could not be held because of lack of cooperation. Some CSOs did not have time, others lacked confidence in the democratic character of current policy making, or it was not seen as clear how the results would be used. Therefore, instead of the workshop telephone interviews were held.
- The major environmental organizations in the Netherlands, like Greenpeace and Friends of the Earth have not been approached because these organisations neither issued position statements or press briefings on nanosciences and nanotechnologies, nor participated in the multi-stakeholder dialogue Nanopodium.

The views of the participating CSO varied on the different aspects, but all CSOs shared and stressed the viewpoint that a voluntary CoC should not replace legally binding safety regulations for nano research and applications (Schenkelaars and De Vriend 2010).

5.4.4

Interviews with stakeholders

5.4.4.1

Nano

Among the ten interviewees were 4 NGOs (3 environmental and health, 1 consumer NGO), 4 commercial organisations (business and industry) and one researcher (consultancy/nanocap).

Several of the questions about risk are considered problematic by the interviewees when it concerns the ranking of risks of different nanomaterials and when the question makes a connection between risks or harm and labelling.

- The ranking of risks of nanomaterials for health and environment is seen as problematic, because this depends on many circumstances, such as application, exposure, type of material, regulation. It is also seen as a matter for experts.
- The questions in which a connection is made between labelling and preventing harm are seen as incorrect. This also accounts for the questions where the connection is made between consumers' compliance with the product information/labelling, when handling nanosilver products and the prevention of harm. Especially the Food industry and the Cosmetics industry point out that products on the market are safe.

- In the question about consumers routines the variety in the answers and comments is that broad that the conclusion could be that the question is not clear.

Main concerns/risks and uncertainties relating to nanosilver

Several interviewees mention the risk for the sewage water treatment and for the surface water. Others refer to experts. Two interviewees see risks as negligible or refer to precautionary measures. As a specific risk the imports from countries like China are mentioned.

The other questions about risk are either ranking questions or relate to the labelling. This makes it difficult to draw conclusions. In several questions interviewees mentioned that there should be no marketing without sufficient data about risks.

Lack of information and uncertainty are mentioned as a main concern, by nearly all the interviewees.

Dissemination of information: product information through labelling

In general the views of the interviewees about the trustworthiness of labels vary widely. Nanomaterials are mentioned twice as problematic.

For product information in general the four NGOs all strongly disagree that there is an informed choice for consumers. The commercial organisations vary in their views. Regarding upcoming EU and national labelling regulation the opinions differ widely about the informed choice for consumers. This could be explained because these regulations (apart from the Cosmetics Regulation) have not yet been established. Two interviewees mention there is an informed choice while referring to the Cosmetics Regulation.

Although the commercial organisations do not always support the use of labelling of nano information and are afraid of too much labelling, most of them have the viewpoint that information should be on the label when the consumer wants this ('right to know').

Despite the fact that more than half of the interviewees agree that most consumers are not interested in nano related product label information, the point has been raised that it is not so much a question of not being interested but a matter of not having enough knowledge to handle the information. Another aspect mentioned is that a small group (opinion leaders) does want to know the information on the label.

Most NGOs are not satisfied with the current labelling scheme for nanomaterials. There is much lack of information. They want nano on the label (list of ingredients) and reliable risk assessment should be required. The commercial organisations agree with the current scheme. They do not see nano specific labelling as important ('there is no danger'). It can be part of the broader la-

belling. The cosmetics industry refers to the Cosmetics Regulation, which is the only specific labelling regulation to date.

Asked for ideas about labelling schemes elsewhere, mention is made of the MSDS (material safety data sheet, for professional use of chemicals) and of the 'aware code', which was developed for paints as a sort of signal labelling. This 'signal labelling' is mentioned as important and three layers are distinguished: 1. colour codes; 2. list of ingredients; 3. reference to producer website and use of mobile technology, getting information via the barcodes.

The commercial organisations emphasize that, when there has to be a labelling system, this should be an EU system.

Perceived role and behaviour of consumers

There is disagreement between interviewees about the role of consumers in relation to the label. The answers strongly depend on the type of consumer behaviour they have in mind. Four commercial organisations, with the notable exception of the cosmetics industry, agree that consumers' compliance is crucial to prevent harm when handling nanosilver products. However, the relation between compliance and prevention of harm is strongly criticized by the others.

All interviewees agree on the broad question that there can be a connection between harm of products and consumer behaviour regarding these products. Information and freedom of choice are not always enough. One interviewee mentions that most consumers cannot choose, so some products should not be marketed.

As a lacunae in the present system the role of the retailer in the product information is mentioned.

Regulatory challenges

The statement that more knowledge about consumer perceptions is necessary to support the regulatory process is supported by nearly all interviewees. At the same time mention is made that the government has its own responsibility to prevent harmful effects of market products and also has to weigh other aspects. Some products should not be marketed. It is mentioned that, in relation to the knowledge gaps, a duty of care should be developed by decision makers (Important last points). (Although it is not mentioned this duty of care might be seen as an aspect of the precautionary principle).

Public engagement and participation

Most interviewees refer to their own situation and conclude that EU NGOs give adequate consideration to national viewpoints. However, some interviewees who interpret the question in general mention several problems, such

as too different viewpoints and conflicting interests; it also depends on the goal and structure of the organisation (sometimes more Europe oriented).

As far as concerns the negotiating at the EU regulatory level most interviewees mention that their views are taken into account by EU NGOs. Three commercial organisations argue the situation is different: they negotiate themselves at the EU regulatory level, or the national organisation follows the EU and sometimes taking into account national views is not possible.

5.4.4.2 **GMO**

Among the seven interviewees were 1 NGO, 1 organic farming organisation, 1 conventional farming organisation, 1 biotech industry, 1 food industry, 1 food retail organisation, 1 international dairy company.

- Some questions were considered too leading by several of the interviewees. This was the case for the ranking of health and environmental risks of GMOs and the question of risks of GM soy.
- The questions which link labeling to potential harm are considered problematic questions by several interviewees.
- The question about everyday routines of consumers and the prevention of harm was considered unclear by some interviewees, while others strongly disagreed about the relation between harm and consumer routines, and others strongly agreed. This variety of answers gives the impression the question indeed was not clear.
- The question what can GMO learn from nano by most of the interviewees was answered the other way around (what can nano learn from GMO).

Main concerns/risks and uncertainties relating to GM soy

Concerns vary widely: there are concerns about the technology and the decision making process, the dependency of researchers of industries, loss of freedom of choice, co-existence problems, fear for crop contamination and fear for a too emotional debate.

The questions about risks are seen as leading questions by the commercial organizations because they do not see grounds for risks. The NGO points at risks because of antibiotics resistance and herbicide problems (resistance against glyphosate). Risks for the countries of origin and negative effects of large scale agriculture are also mentioned.

For the risks of GM soy the contamination of non GM soy by GM soy for feed is mentioned by the organic farmers and the fact that veterinary drugs are only GM drugs (NGO) and the loss of freedom of choice because of the contamination.

Dissemination of information: product information through labelling

Most (5 out of 7) interviewees agree that in general current product information provisions enable consumers to make informed choices. It is criticized by the NGO (unclear labels) and by the organic farmers (lacking E-numbers; much work to find out what is exactly in a product).

Also for GM labelling most interviewees agree that labelling enables informed choices. Again the NGO and the organic farmers disagree because there should be more on the label; vitamins are not taken into account in the labelling.

The trustworthiness of product labelling in general is agreed by four interviewees. The NGO notes this depends on the enforcement (referring to SKAL as a good example). The Biotech organisation stresses that the problem is not the trustworthiness but the understandability of the label.

Four interviewees agree with the statement that most consumers are not interested in the information provided through GM food labelling. The two disagreeing interviewees motivate this with the fact that consumers do not know that GM products are on the market and that conclusions cannot be drawn with so few GM labelled products on the market.

Four interviewees are content with the current GMO labelling; three interviewees disagree. The disagreement is either because the labelling requirements reflect a strange idea of reality, e.g. because labelling is already required when there is a very small percentage of mixing (1 respondent), and because of a lack of freedom of choice regarding products of animal origin, cotton, bio fuels, vitamins and the 'filling up' of the 0,9% (2 respondents).

The provision for a label 'made without gene technique' is seen as a national scheme by four interviewees and by others as an EU-scheme with flexibility for Member States. Three interviewees want a more harmonized EU label. The dairy company strongly opposes a national label. The NGO sees too many lacunae in this provision because requirements are too strict and the result is now that it is hardly used; so they conclude there is a lack of freedom of choice here.

Changes in the current labelling scheme are wished by two interviewees, for feed, cotton, bio based products and products made with GM microorganisms. Two are more or less content with the current scheme. Two interviewees suggest ending the labelling scheme because it is a form of process labelling instead of product labelling, or because it should be more rational.

Two interviewees mention another labelling scheme which could hold advantages: the German 'ohne gentechnik' (GM free label) is mentioned once and the US system where the producer is free to choose for communication GM or Non GM is mentioned once.

Perceived role and behaviour of consumers

The relation between the routines of consumers and the prevention of harm is not only criticized because of the connection between harm and the daily routines but also because harm for the environment is caused in an earlier stage, in the countries of origin.

Five out of seven consumers disagree with the statement that there is a connection between harm to health and environment and the consumer purchasing behaviour. The NGO refers to the answers given before and the organic farmers note there is a connection in the way that health and environmental concerns are a reason for not choosing GM products.

Regulatory challenges

The statement that it would be necessary to know more about consumer perceptions to support the regulatory process is either disagreed with, or seen as complex (e.g. difference between consumer and citizen).

Public engagement and participation

All interviewees agree that EU stakeholders take into account national points of view of the national counterparts. However, some also notice that there can be difficulties, because agreement is not always possible. About the opportunities to engage in EU procedures there is also agreement, but at the same time the difficulties are mentioned: overkill of information, huge amount of time it costs to participate and a lack of feedback about what is done with the results.

5.4.5

Focus Groups

This chapter provides an overview of the results of the focus groups with consumers in the Netherlands. It aims to summarize the results of the two case-studies (nano and GMO) and to compare these results. In each section the findings of the focus groups are compared.

Four focus groups in the Netherlands were carried out between May 19 and July 5 2011. For each technology two focus groups were conducted and for each technology 12-14 participants attended the discussions. Up to 8 persons attended the single focus groups.

5.4.5.1

Participants

In general, the participants of both focus groups series had a heterogeneous background in terms of socio-demographics and profession. There were no planned contrasts. The focus groups are not representative with regard to gender, age and education.

The following tables show the gender, age and education distribution of the focus groups compared to the Dutch population (Source: CBS Statline).

Gender distribution (2010)		
	<i>Male</i>	<i>Female</i>
Population %	49.4	50.6
Nano sample in %	21.4	78.6
GMO sample in %	25.0	75.0
All focus groups in %	23.1	76.9

In terms of numbers, the women's views were stronger represented than the men's views.

Age distribution (2010)					
	<20	20-40	40-65	65-80	>80
Population in %	23.7	25.3	35.7	11.4	3.9
Nano sample %	0,0	28.6	71.4	0.0	0.0
GMO sample in %	0,0	58.3	33.3	8.3	0,0
All focus groups in %	0,0	42.3	53.8	3.8	0,0

The focus groups missed out the point of views of person under 20 and over 80 years. In comparison to the population the views of 20-65 years old persons were clearly overrepresented.

Education distribution (2010)		
	University	Other
Population in % (base: persons 15-65 year)	9.0	91,0
Nano sample %	50.0	50.0
GMO sample in %	41.6	58.4
All focus groups in %	46.2	43.8

With regard to the different levels of education the focus groups were not representative, as well. For both focus groups series the respondents with university degrees were overrepresented.

During the GMO discussion it appeared that there were salient differences of opinion between persons with different degrees of sympathy for organic food. This happened in both GMO groups but it was not a planned contrast.

In all the groups there were differences between persons who were to a certain extent concerned about the impacts of products along their life cycle and persons not referring to those indirect product impacts.

5.4.5.2

Response to the focus groups

The focus group guideline was an appropriate instrument to get information about the practices and the beliefs of the participants. It should be noted, however, that the number of questions is large and that the questions vary in the level of detail. Because the participants are not aware of this, the facilitator has to be flexible in specifying the focus of the discussion. This flexibility requires that the facilitator knows which topics are crucial for the project as a whole.

The most stimulating parts of the guideline were the questions that enable the participants to tell each other something about their daily practices. Another stimulating part were questions accompanied by a product that they can inspect.

In the case of GM, the participants were able to answer most of the questions. Yet, they did not always make a proper distinction between "modified" and "genetically modified". Both terms can also be found on packages and may cause confusion.

In the case of both focal products, there were several questions that assume more familiarity of the participants with the new technology product than they had. As a result, there was not much response to questions about differences between GM margarine or a nano chopping board and the conventional product, and about a friend who wants to buy or avoid the new technology product. Although the focus group guideline could be used in these cases, its potential as an instrument to reveal consumer practices and beliefs was not fully realized.

According to the evaluation question at the end of the session, all the participants enjoyed the discussion about the products quite well.

5.4.5.3

Perception and knowledge of the technologies and products

In both focus groups series the participants were rather unfamiliar with the technological issues and had no experience with the new technologies' products on the market: They never considered buying those products intentionally.

Perception and knowledge of the participants was gathered with some open "what comes to your mind" questions at the beginning of the focus groups. Additional responses were obtained with subsequent questions on purchasing criteria, as well as, on consumer information.

Genetic engineering and its products

The technical definition presented by the facilitator to introduce the technology was not enough to explain GM to the participants, but they took the information for granted. They were familiar with the notion of GM and they had associations with a number of products, including GM soy.

"Soybeans, corn; there are also tomatoes, but I don't believe that they are being sold."

"I am a vegetarian and I eat a lot of products that contain soy. Sometimes I wonder whether that is a good thing."

"Soy is used in fodder making, but I wonder whether GM soy is used for that purpose, because, in principle, GM products are not allowed. But imported soy may be contaminated by GM soy."

The associations with GM products triggered the cultural divide between those participants who had a preference for organic food and those who preferred conventional food. As a result, they did not discuss the topic of GM as such, but put more emphasis on some broader aspects of GM agriculture, in particular the use of pesticide and to a lesser extent the role of patents and big companies.

"What is bothering me is that a large company can own patents on genetically manipulated plants. What nature gives us for food should not be the property of a private company. As a result, the food becomes instantly unnatural to me, because it must have been created in an artificial way."

In response to this type of statements, the participants who did not have a preference for organic food also paid attention to the global food situation.

"You should put this issue in a broader perspective. There should be enough food for the whole world population. That can make it necessary to modify crops to prevent farmers from using more pesticides to try to keep food production up with demand. It is, in fact, a very complicated choice. It is also a question whether it is a good idea to want only organic food. Lately, it has been in the news that organic farms are not much better for nature than

conventional ones and that they need a greater area of land to deliver the same output, at the expense of nature. So, everything has to have a trade-off. That makes it extremely complicated.”

Several participants were well aware that there are international differences in the regulation of GM products.

“I have heard that there are GMO products on the market in the USA, but I don’t know whether there are any GMO products on the market in the Netherlands.”

“In the USA there are products, sugar if I remember it well, which contain in large print the wording “GM free”. You don’t see that here.”

The question “And what comes to your mind if you think about GM soy margarine?” revealed considerable uncertainty among some of the participants.

“That is something you don’t know as a consumer. Well, you can try to find out more about it on Internet or wherever, but it is not stated on the package, that is for sure. As far as I know, it is not allowed to sell GM products here.”

“May be there is GM soy in my soy margarine. I must admit that I am a “bad” consumer, because I have never checked it, but I can imagine that it is in it. On the other hand, the Netherlands is rather strong in its regulation.”

“As far as I know, there is considerable fiddling with soy, whether it has been modified, or contains pesticides. There also has been a lot of cross-breeding.”

Nanotechnology and its products

The technical definition presented by the facilitator to introduce the topic of nano products and nanotechnology was not enough to explain nanomaterials to these participants. The information about small particles did not stimulate their thoughts, although the term “nano” generated some associations with products, such as cosmetics, sun lotion, socks, coatings, cleaning products, and small white colouring matter.

Some participants had associations with stories about applications that might not be completely safe.

“Nano is a kind of hype in the Netherlands; it is hip, but the hype may also be associated with some fear.”

“But it is unclear what will happen with sun lotion on your skin; it might be harmful if the nano particles penetrate into the skin.”

“My association is that it is used for several purposes, but that it might not be completely safe.”

The under mentioned associations were triggered by the question “what comes to your mind if you think about nano-silver chopping boards?”

“If there is nano-silver on the chopping board, it might get into your food.”

"If you eat small pieces of plastic, that is not really a health problem, as far as I know."

"There is a paint that was used for boats because it protected them from algae, but it also caused water pollution and it has been banned. That is my association. Nano-silver in a chopping board will be anti-bacterial or anti-pathogenic. I would be somewhat worried about that, because how can the particles be effective if they are completely contained within the board. But maybe I am wrong."

Because the participants were not able to say anything about nanomaterials, they focused on those aspects they were more familiar with, in particular, the type of material for a chopping board. Some participants were worried about the idea that tiny pieces of wood or plastic may end up in the food. Others were concerned about the supposed anti-bacterial effects. Moreover, the participants did not seem to have a clear mental model of the ways in which bacteria grow and how they can be killed.

"If it kills the bacteria, what will it do to your food?"

"If it kills the pathogenic bacteria, what will it do to the good ones?"

Comparison

In the case of nanotechnology, the participants had to discuss an issue they were unfamiliar with in combination with a low-involvement product. Because the participants were not able to say anything about nanomaterials, they focused on those aspects of the topic they were more familiar with, in particular, the idea that tiny pieces of a chopping board may end up in the food and the supposed anti-bacterial effects. However, there was not much response to several of the questions.

Although margarine is not really a high-involvement product, it is more related to taste and health than a chopping board. Moreover, GM was somewhat more familiar than nanotechnology. This difference had several consequences. When people talk about familiar issues, they are more inclined to confirm their existing beliefs. In the case of GM, the issue triggered the cultural divide between organic and conventional consumers. This should be seen against the background of the general cultural developments in the western world.

Ideas around organic farming developed in German and English speaking countries about a century ago, when they were undergoing similar changes in the food system⁹⁰. In Germany it was part of an influential movement that became known as the *Lebensreform*; the Netherlands, the United Kingdom and

⁹⁰ Vogt, G. (2007). The origins of organic farming. In W. Lockeretz (Ed.), *Organic farming: An international history* (pp. 9-29). Oxfordshire: CAB International.

the United States also had reform movements. The movements have cultivated specific beliefs about human relationship with nature and the responsibility of consumers.

With regard to nature, organic consumers are motivated to avoid errors in dealing with natural processes and living organisms, including themselves⁹¹. They use an implicit ordering of potentially error-prone human interventions in a living organism, which ranges from synthetically produced chemicals, via GM to conventional interventions. This ordering may explain that the participants were in fact more concerned about synthetic pesticides than about GM as such.

Sensitivity to the notion of synthetically produced chemicals may also be relevant in the context of discussions on nanomaterials, which can be distinguished into natural and manmade. However, this distinction was not made in the present study. The implicit ordering of human interventions might account for the observation that some participants were more worried about small particles in their food than about bacteria that can be removed by scrubbing and air-drying.

5.4.5.4

Purchasing criteria

In both focus groups series the importance of the products was low, although there were individual exceptions.

The margarine the participants used to butter bread is often called "halvarine", a form of margarine with half the amount of fat that margarine contains. Some participants were very keen about the margarine they use (no taste, enriched with vitamins, healthy for children). Others said that they just buy the product that is on offer.

Chopping boards are used on a daily basis. They are not replaced very often. But if that is necessary, the participants just buy a new one. Some participants had about 4 chopping boards, each for a different purpose (e.g. things that are dry, things that are wet, bread, onions, vegetables, meat, poultry). Some had 1.

Conventional margarine and GM-margarine

Margarine is used on a daily basis and it would be missed if it was not there. It has some extra importance for participants with young children. There were some very divergent ideas about taste (margarine should not be tasted / it may have some taste, but it should not be too creamy). Some also said to pre-

⁹¹ de Boer, J. (2010). The role of prevention-oriented attitudes towards nature in people's judgment of new applications of genomics techniques in soil ecology. *Public Understanding of Science*, 19(6), 654-668.

fer margarine from the natural shop, such as soy margarine. Some participants said that they just buy the halvarine that is on offer.

Initially, the participants were not aware of the fact that they could buy GM margarine. They had no clear answers to the question whether they can imagine that there is a difference between GM margarine and conventional margarine.

“What is important to me is which margarine is healthier, but, in my opinion, something that has been “manipulated” would by definition not be healthy.”

“I feel hesitant about what you hear about GM. If they mention it, they will do that in very small print, but vitamins are identified in large print, so the former has a negative association in contrast to the latter. If GM would become common, I will go to the natural shop to avoid it.”

“Maybe, they can add more taste.”

“If there was margarine with the taste of real butter, I would buy it, but if it was GM margarine I would feel hesitant to eat it. Yet, I wonder whether that is reasonable, because I cannot imagine that I can take up genetic material that can change my genetic makeup. But still, GM material is scary to me.”

“Now I’m starting to doubt whether my soy margarine contains GM soy. I remember to have seen something about GM free.”

“Maybe, GM margarine is cheaper”.

“Maybe, it contains more pesticide. Because if GM crops use more pesticide than non-GM crops, it will also end up in the product.”

The participants had no clear image of reasons to buy a GMO margarine. They again referred to the “organic versus GMO” theme.

“The issue is difficult to resolve. On the one hand, you hear organic is better, on the other hand they say that it is not possible to feed a large number of people in this way. For a layperson it is difficult to draw a conclusion. If you knew that the world cannot do without GMO food, and you would think it is healthier because it uses less pesticide, and it may be cheaper, you would buy it.”

After being asked to imagine they are inside the head of a friend who wants to avoid buying a GMO margarine the participants had no very specific ideas. The users of organic food gave some response to this question.

“Apart from the fact that it has been genetically modified, they often use more pesticide. Therefore, I prefer organic food. Even organic vegetables have to be washed carefully, but they may be somewhat healthier and more environmentally friendly.”

“The reason why they present in large print the wording “GM free” in the USA is that people don’t want to ingest it.”

"In my opinion, GMO margarine is not dangerous for human beings, but I am worried about the impacts of GM on other crops, such as organic crops. "

Overall, the participants were more inclined to discuss the general issue of GM production than the specific pros and cons of the focal product. Although there were some speculations about GM margarine being more tasty and cheaper, the participants did not see a relationship between the GM product and their most important criteria when buying margarine. However, during inspection of the GM product, they noticed that it might be interesting for buyers of discount brands.

Conventional chopping boards and nano-silver chopping boards

Size and type of material were important criteria for the participants when they buy a chopping board. The type of material was a recurrent theme in their discussion and they had diverging preferences on this matter. There were preferences for chopping boards made of wood, glass and plastics. Some participants preferred one type of material (only wood, only glass, only plastic), others had different types of cutting boards.

"I have heard several horror stories about wooden boards, therefore I prefer plastic ones."

"I prefer a wooden board; it is somewhat less hygienic, but it is practical and beautiful and it protects my knives."

"Plastic dries much faster than wood, and you will get much less bacteria if the board is dry; wood has to be cleaned by rubbing with salt."

"I prefer glass because I don't want tiny pieces of wood or plastic in my food."

"Wood is natural material, there is no reason to worry about small pieces."

"There is no reason to worry about tiny pieces of plastic, these will not be taken up by the body."

None of the participants had heard that there are nano-silver-coated chopping boards on the market. They had no clear answers to the question whether they can imagine that there is a difference between a nano chopping board and a conventional chopping board. After the antibacterial effects had been mentioned, there was some understanding that this might be relevant.

"I can imagine that someone wants a chopping board with an anti-bacterial effect."

Another association was that nano chopping boards might be more wear-resistant.

After being asked to imagine they are inside the head of a friend who wants to buy a nano chopping board, the participants had no clear notion of such a

person. Some participants suggested that a nano chopping board might be attractive for persons who are extremely concerned about hygiene.

“Someone who keeps spotless house.”

Similarly, there was not much response to the question about the most important reason why their friends want to avoid a nano chopping board. But a reason for avoidance might be that such small particles are found scary.

“I don’t know where these small particles are going to end. I just have an association with asbestos.”

Overall, there was a mismatch between the attributes of the nano chopping board and the criteria that are important for the participants (i.e. size and type of material). The participants did not mention a bacteria issue when they talked about the main criteria. They were more concerned about the idea that tiny pieces of wood or plastic may end up in the food.

The anti-bacterial effect was not understood and not appreciated. Participants who were concerned about hygiene mentioned other ways to reduce the growth of bacteria (e.g. scrubbing and air-drying). They got the impression that this product was pushed by the producer. In their opinion, it might only be of interest to those persons who are extremely concerned about hygiene.

“I don’t need a chopping board with an anti-bacterial effect. My chopping boards are made of glass and I am very happy with them. ”

“Glass can be cleaned very well and there is nothing that can penetrate into it”

“I don’t want a nano product, because it is very uncertain what might happen with the nano particles. They might migrate into your body or the environment.”

“The producers appeal to the fear of bacteria. Maybe this is a product that elderly persons will buy, or persons who are extremely concerned about hygiene.”

“A wooden board can be cleaned very well, using water and salt.”

Although the participants were not in favour of the nano product, they were willing to consider its pros and cons. Some had the idea that a nano chopping board might be attractive for persons who are extremely concerned about hygiene. Others mentioned alternative ways to clean a chopping board. Apart from these pros and cons, some participants also raised more general questions about the potential migration of nano particles into the body or the environment.

Comparison

In both cases the participants had no experience with the focal new technology products on the market, nor did they knew about others’ experiences.

They had only some vague idea of what the new technology product meant. In both cases the focal product was of relatively low importance. However, some were keen about their margarine or chopping boards.

In both cases, there was no match between the perceived attributes of the focal new technology product and the criteria the participants used in making their buying decisions. However, in the nano case the participants were more willing to consider the pros and cons of the new technology product than in the GM case. The antibacterial effect was considered as a distinct attribute and it was suggested that the nanosilver chopping board might be interesting for a niche market of persons who are extremely concerned about hygiene.

The evaluation of the GM product was often based on a general image of the technology. However, when it appeared that the GM margarine was sold as a discount brand some participants mentioned that this product might be interesting for consumers who want cheap margarine and who tend to be unaware of its ingredients.

5.4.5.5

Consumer Information

The questions about consumer information were discussed in three rounds. In rounds one and two a product with an on-package label was distributed among the participants. In round three, the print out of a website was distributed. This part of the focus groups led to higher response and discussions.

Labels: GM-free label and nano-product label

In the GMO groups, the package of halvarine with the label “produced without gene technology” was silently inspected by the participants. None of them had seen this specific label before.

“I have never seen this label before, but I remember soy products offered by the natural shop, which contained the statement that the product was manufactured from soy that has not been genetically modified.”

In particular, the users of organic food said that the label appeals to positive emotions or gives a feeling of safety and reassurance.

“If I saw such a label, I would feel safer.”

“I notice by myself that I am quite sensitive to these kind of things. I don’t believe the “ik kies bewust” logo (Dutch “healthy choice” front-of-pack label), but in other countries, such as the UK, they give far more extended product information, for instance, whether it is vegetarian. Such information makes me believe that it is a better product.”

“This gives me a feeling of security and confidence. Because the problem is not so much the technology, but the fact that you, as a consumer, do not know in which products it can be found.”

Apart from these positive associations, they did not know whether this label would influence their choice of margarine. The participants who did not mention positive associations also said that they did not know whether this label would influence their behaviour.

In the nano groups, a conventional chopping board with a “ten minus nine” logo was distributed among the participants. The presence of this pure “nano logo” attached to a chopping board did not mean anything to the participants, although it triggered some associations with commercial purposes. Some participants recognized the scientific notation “ten minus nine”.

“Does not mean anything.”

“I assume that it is incorporated within the product.”

“Maybe it has to suggest some extra quality that makes the board more expensive.”

“Yes, like an advertisement: Now with nano!”

It did not mean anything, because they were not familiar with nano materials, and they saw a chopping board as an uncomplicated product, which they replace when needed.

In comparison both labels were unfamiliar to the participants and they did not provide the sort of information consumers needed. As a result, the labels were not seen as a useful shopping aid (i.e. a cue used by shopping consumers to distinguish the products they want from the products they do not want). However, the GMO free label was appreciated by some participants as a kind of safety signal, which makes the market more transparent. Although they did not use the specific term, they could have linked this to the freedom of choice issue.

More detailed product information

In the GMO groups, the second product was a package of halvarine, which provides a list of ingredients and the statement “containing genetically modified soy”. The participants recognized the discount brand (Euro Shopper), but they were surprised that this was a GM product and that it was on sale in the large supermarket chain (Albert Heijn) covering close to 33% of the entire food market in the Netherlands.

“I really thought that it is not allowed to sell these products.”

None of the participants had seen this information before.

“This is something that you normally don’t read. In particular, consumers who use to buy Euro Shopper will not read this information.”

“I am wondering now whether this statement also applies to other margarines that Albert Heijn offers.”

“Maybe it is also used in other margarines.”

The participants reported that they would not notice this information. Therefore, they could not say whether this would influence their choice of margarine.

“I cannot read this small print in the supermarket, without reading spectacles, but I would not buy the product if I could read it.”

“No influence. How many people will look at the ingredients of margarine? You assume that halvarine is plant-based and what you want to know is specific information on vitamins. That is also how producers want to position their product.”

“I would buy it, but without regarding the information, just because I am not loyal to any brand. The next time I will buy something else.”

“If there is choice and I don’t have to buy it, I would prefer not to.”

“The funny thing is, the label that it contains GM gives me the same feeling of safety as the label that it is GM free. The fact that it is mentioned means that it has been tested and checked, and that there is an agency that approves it. Thus, if it is indicated on the package, I also feel confident about it and think it is OK.”

“I do remember now that I have seen this statement on another product and that I thought hey.”

“I would want to know who is responsible for the label, because I am always cynical about labels. We just have to trust that the label is correct. But it happens often that things appear to be different from what they expected. For example, that something is believed to be healthy but is not.”

In general, the “containing genetically modified soy” label did cause some surprise. Offering more on-package information was seen as a cue that there is more control on products. But the participants also reported that, under normal circumstances, they would not notice the “containing genetically modified soy” statement. They cannot read this small print in the supermarket, they do not expect this information and they are not interested in all the ingredients of margarine.

“() You assume that halvarine is plant-based and what you want to know is specific information on vitamins.”

In the nano groups, the second product was the only nano chopping board that is on sale in the Netherlands (to the best of our knowledge). It can be bought in specialty shops for cookware. It is a plastic chopping board with on-package information about its anti-bacterial effect, which is attributed to “active ingredients that do not migrate and kill bacteria on the surface of the board”. The participants were not aware of this product and they looked at it with amazement.

The notion that the “active ingredients do not migrate” raised questions about what that means. Some participants said not to believe that such a claim can be true (“maybe only if the board is not being used”).

“It is plastic and that means that tiny pieces of it will get into your food. I don’t like this type of material, because it is disgusting to find pieces of plastic in your food”.

“I agree that it is disgusting, but that does not mean that the active ingredients migrate out of the plastic into your body.”

“If you don’t know what the active ingredients are, you cannot say how harmful they might be.”

“If you believe that it has an anti-bacterial effect, you don’t know how long that will be effective. Maybe, you will get a lot of bacteria growing on the board if it has lost its effectiveness.”

The question whether this information would influence their choice of a chopping board refuelled the discussion on pros and cons.

“No, I don’t think that I would buy this product if I read this text.”

“Well, I prefer a product with this information over one without it. Maybe it would influence me, but I still will keep on using different chopping boards for different purposes. I will not think that I can do everything using one board.”

“No, I would not dare to buy such a product. There are too many things that have been reconsidered in hindsight, because they appeared to be not as good as they should be. I would only buy it if it had a thorough safety stamp.”

“Several conventional cleaning products containing chlorine are also anti-bacterial.”

“Yes, but I don’t want to use cleaning products containing chlorine. Water and soap are enough.”

In comparison, the more detailed information was received more positively by the participants than the unfamiliar labels. In both cases, the reception of the information was largely dependent on what consumers expect to find. Most consumers (except vegetarians and people with allergies) do not expect to find relevant information in a list of ingredients. In contrast, consumers do expect more information about distinct product attribute claims, such as the antibacterial effects.

Website information

Due to the high Internet penetration in the Netherlands (about 90 %), all participants were familiar with websites that provide product information. They said to use such websites when there is a reason to do that. The reason may

be that they want to check something they are worried about or to get more information on something that is novel. Those who didn't need the product and the information still had the opinion that the information should be available for others.

In the GMO groups, the print-out was a page from GMO compass. In response to the question whether they would follow the hint on a product package to such a website to find out more about the product almost all participants responded with reluctance.

"Even if I would notice the hint, I would forget it."

"It also depends on the number of products. If the number of GM products grows, there will be more news about their safety and then I may visit such a website to find out more about it."

"A website can be useful as an additional and complementary source of information to a product package, but it is not enough."

Two important factors are their level of interest in an issue and their trust in sources of information.

"For me, it is an important question who is behind this site? With regard to food I am always very suspicious. Is the producer the source of the information or is it some group who wants us to turn back to become hunters-gatherers again?"

"As a consumer I find it very difficult to assess whether I can trust the information."

"Yes, each organization has its own agenda and that also applies to governmental agencies, such as the Netherlands Nutrition Centre."

"I remember how the government wanted to increase the consumption of milk, simply because there was an overproduction."

"I may use a website when I am curious what the label "produced without gene technology" means."

"It strongly depends on what you are interested in. You can check E-numbers in the supermarket if you have iPhone; then you see something you are interested in and you can check it immediately. That is different from just visiting a website."

"If GMO is a hot item, I may use a website to find out more about it, but if it is not hot, my interest is too low."

The participants did not have the opinion that this information would influence whether they buy GMO margarine.

"The real problem is that we don't know what we eat, there is too much processing of food, therefore, it is better to eat as pure as possible."

“Well, I wonder what that means. How do you know whether something is healthy for you and not manipulated?”

“The supermarket Albert Heijn also uses a special “pure and fair” label. If you buy a product with such a label, you feel that you are doing something right.”

“Think about all the warning labels on cigarettes. That does not work. Certain products should not be on the market.”

Another point is that a website may not help to reduce complexity and ambivalence.

“I am very ambivalent about soy, but I did not visit a website to find out more about it. I do eat soy but I have the idea in the back of my head that it has several drawbacks. In fact, I do not know what to think about it.”

In the nano groups, the website of a specialty shop provided additional information on the product. The print out mentioned “silver ions that kill 99.99% of all pathogenic bacteria and that are incorporated within the material (no surface layer). Its period of operation is 20 years.” The print-out generated several spontaneous remarks.

“They say that the period of operation is 20 years, but it will become waste, sooner or later. And what happens then with the bacteria?”

“This information about the silver ions should be explicit on the package. This is much clearer. The on-package information should refer to the anti-bacterial effect, the silver ions and the nano character of the product.”

“But consumers don’t know what nano is, so it does not mean anything if that information is on the package.”

“At least there should be a possibility to make informed choices”.

“Many consumers will just buy a chopping board at the moment they need one and they will absolutely not make any effort to read the on-package information. Except, maybe, when large print is used, on the front side.”

The information was not considered very valuable.

“I don’t need this product and this information, but I think it is important that the information is available for others.”

“But this information is not available when you are in the shop.”

“In fact, the website does not provide very much information. But it does suggest that the producer wants to address negative feedback from consumers, for example, about the ingredients that do not migrate. Apparently, many consumers have the impression that the ingredients will get into their food.”

In response to the question whether they would make an effort to visit such a website to assess about nano chopping boards the answers were mixed.

"No, I will not do that for a chopping board!"

"I may visit such a website but that depends very much on the product".

"I will not buy this chopping board, so I have no reason to visit the website."

"No, if I need a new chopping board, I will just go to the shop and buy one."

"I may visit such a website if I have a reason to assume that something is wrong with a product or if something is completely new."

The participants did not have the opinion that this information would influence whether they buy a nano chopping board. The question again refuelled the discussion on pros and cons.

"This is a typical example of a product that is being pushed by the producer. I simply don't need it; my chopping board is very clean."

"It is important that more information becomes available. Maybe that other people see nano as something that is "hip" or something that has been tested. So, they think it is OK."

"Other sources of bacteria, such as the tap, are more important."

"When I get diarrhoea, it is usually caused by food that I consumed out of my house."

"It is not a good idea to make everything sterile." "Maybe I am more concerned about these small particles than about bacteria, but on the other hand, I don't eat chicken anymore, just because of the bacteria."

In comparison, in both cases the main points mentioned by the participants were their level of interest in an issue and their trust in sources of information. In general, the opinion was that a website can be useful as an additional and complementary source of information to a product package, but that it is not enough.

Comparison

In both cases the focal products did generate some amazement, but no strong need for information. The participants did not explicitly elaborate on ethical issues, such as freedom of choice, but there were some hints in that direction. They indicated to appreciate more transparency on the use of GM and nanotechnology in the products. However, a pure "nano logo" was considered meaningless or only relevant for commercial use. Although they reported that, under normal circumstances, they would not notice all the labels, offering more on-package information was seen as a cue that there is more control on the products.

In both cases the participants were, in principle, sympathetic to the use of websites to provide product information, but not as a replacement of on-package information. Those who didn't need the product and the information still had the opinion that the information should be available for others. How-

ever, the participants expressed strong concern about the sources of information. It was considered difficult for consumers to assess whether they can trust the information.

5.4.5.6

Responsibility of actors

The interview guide contained several questions on the responsibility for minimizing the negative impacts from consumer products and the responsibility to assure that a consumer has enough information about products on the market.

In the GMO groups, there were lively discussions in response to the question “who do you think should be responsible for minimizing the negative impacts from consumer products?” The role of consumers themselves was an important issue.

“I only use a very small amount of margarine to butter three slices of bread.”

“Each of us has a certain responsibility. But many consumers are rather passive when it comes to using the information that is already available.”

“But what is it that I can do? Do I have to go to the shop and ask the shop owner how the food has been produced? Is that what you mean with becoming active?”

“In fact, we are all invited to be passive; you can be passive. We all have more important things to do.”

“I am well willing to take the label into account, but not more than that. And even the labels are not always so good. I have heard some critical remarks about them but I am not the kind of person who dives into this issue.”

“It is difficult for an individual to make trade-offs. Again and again, there is something new. And the government also cares about other interests than my interest as consumer. But, if GM products caused adverse health effects, the government would act.”

“There is a difference between short- term and long-term health effects. It is too early to say something about the long-term effects. Take the example of smoking and lung cancer.”

“What is worrying me is that the big companies will, on the one hand, think about their social responsibilities, but, on the other hand, attend to their commercial pursuits.”

“I don’t go to the natural shop, because that is too expensive. So, I go to the supermarket.”

“You are not aware of it when you are walking through the supermarket.”

“This depends on whether you can trust the information that is on the package.”

"I have heard that in Germany there is much more control on food issues and that they also offer more on-package information. How much control there is with regard to GM I don't know. But the fact that there is more information on the package gives you the impression that there is more control."

"It would be nice if the government and the producers took more responsibility and only provided products that are good. That would be more efficient than that everybody has to read the labels."

"It is also a matter of volume. As long as people are allowed to buy cheap stuff and plenty of it, they will do that. The government should play a role in raising awareness that this cannot go on."

"The example of smoking suggests that you can reduce the consumption of certain products by socially disapproving of it enough."

In general, the participants were broadly aware of the complexities related to food production and consumption. Yet, they also said not to be aware of it when they are walking through the supermarket.

There was also much debate with regard to the question "who do you think is responsible to assure that a consumer has enough information about products on the market?"

"The government is responsible, because companies care primarily about maximizing their markets. We don't have much choice in the Netherlands; there are only a few supermarket chains."

"That should be organized at the European level, because companies are also organized at that level."

"As consumers, we are also responsible, but to a lesser degree. And many people don't take that seriously. If you see what consumers buy and that they only care about prices, you wonder why they do that."

"I don't think that I, as a consumer, should be constantly mindful of how to make the right choices. There are simply too many wrong choices that you can make. Producers should not be allowed to evade their responsibility by putting a label on a product."

"Yes, but it is we who do it. We choose cheap products, such as low-priced meat. And soy, in particular GM soy, is needed to feed the animals. This is all related. Therefore, the government should try to reduce meat consumption."

"In my view, the shop is responsible, because that is the point where it all comes together."

"As I see it, the government is responsible to make the rules about which information should be available. And the producer is responsible to make that information available, because there is no government that can oversee what is happening in all the international food chains. So, it is a shared responsibil-

ity and a civil society organization, such as a consumer union, should safeguard consumer interests.”

“Everybody has responsibility; each participant in the chain has its own responsibility.”

“The government should define the lines and the producers are responsible for meeting the requirements. Consumer organizations are useful, but not really responsible.”

“But what about the amount of information. This list of ingredients still leaves open what kind of oil has been used. So, the question remains which information is essential for us.”

Overall, the answers revealed the cultural divide between those participants who had a preference for organic food and those who preferred conventional food. It should be noted that the reform movements cultivated the ideal of “the independent consumer” who is uncontrolled by the commercial market (Gusfield 1992). This ideal may give rise to an individualistic understanding of one’s responsibility as consumer, resulting in high moral standards and worries about making wrong choices. The high standards of this ideal may explain feelings of failure (“*I must admit that I am a “bad” consumer*”) and being overburdened (“*There are simply too many wrong choices that you can make*”).

The conventional participants were less involved in matters of food and less worried about their role as consumer (“*If it tastes good and it is available on the shelves, than it is OK for me*”).

A closely related theme is that the natural foods movement sees more connections between the health of people and the health of other organisms than conventional consumers do. This may account for the way the participants referred to the use of pesticides as a threat to their own health and to the plants that are available to their descendants. (“*Apart from the fact that it has been genetically modified, they often use more pesticide. Therefore, I prefer organic food.*”) Again, the conventional participants were less bothered by such concerns (“*If GM products caused adverse health effects, the government would act*”).

In the case of food production, the notion of a chain may be more prominent than in the case of other products. This may explain that references were made to shared responsibility and to the responsibility of each participant in the chain. Yet, certain statements were also strongly influenced by perceived antagonism between producers (“*companies care primarily about maximizing their markets*”), governments (“*the government also cares about other interests than my interest as consumer*”) and consumers (“*we all have more important things to do*”).

In the nano groups, there were also lively discussions in response to the question “who do you think should be responsible for minimizing the negative impacts from consumer products?”

“What consumers can do is very marginal.”

“There is a small group of consumers who consider the environmental impacts of a product when they are shopping. The group that takes the environment into account when they dispose of a product is even smaller.”

“It is very difficult for a consumer to make the right choices. For example, I expect that, from an environmental perspective, a wooden chopping board is better than a plastic one, but I might be wrong. And there is no information that can help me.”

“Consumer information should be improved significantly.”

“Yes, but the average consumer does not pay attention to this.”

“Still there are some small improvements. For instance, consumers are using less plastic bags nowadays.”

“What you also see is that consumers are very worried about a single product attribute while they almost neglect all kinds of other things. For instance, they don’t want a nano chopping board, but they have no worries about any impacts of mobile phones.”

“Everything can have negative impacts, each product. But you have to explain this and that means that you have to generate too much information. A consumer is unable to process all this information and to assess whether it is appropriate. Hence, this choice has to be made for you.”

“It is the producer who should prove that the product does not cause any harm. In the past, there were mandatory certificates, such as the Dutch “Ke-makeur”. As a consumer you should be allowed to assume that a product is safe. But producers are more concerned about their profit than about the environment.”

“Consumers do play a role, because they can decide to buy it or not.”

“Yes, but it is extremely complicated to assess whether a product is appropriate.”

“And it would not be a good idea if a product is allowed on the market and only the more mindful part of the consumers will avoid it, whereas the others assume it is safe. Because then the product will still cause harm.”

“As far as I am responsible, as a consumer, I need honest information. There should be a quality assurance of the information, provided not by the producer but by an independent agency. Because you don’t trust the producer.”

Hence, the participants were very well aware of the differences between consumers. They mentioned a small group of consumers who take the environ-

ment into account when they buy a product or dispose of it. In their opinion, it would not be a good idea if a product is allowed on the market and only the more mindful part of the consumers will avoid it, whereas the others assume it is safe. The reason is that then the product will still cause harm.

There was also a lively discussion in answer to the question “who do you think is responsible to assure that a consumer has enough information about products on the market?”

“The producer is responsible.”

“It is an interaction between producers and consumers.”

“There has to be control over what the producer does. And that control should not be dependent on consumer organizations.”

“There has to be a kind of control that enables consumers to check whether certain claims are true.”

“And if certain knowledge is lacking, they should acknowledge that.”

“It is in the public’s interest to have appropriate product information.”

“But, think about the e numbers on food labels, what can a consumer do with this information?”

“Well, that is the personal responsibility of the consumer. If the consumer does not want a nano product, he should be able to make that choice.”

“If a product is on the market, you may expect as a consumer that it meets certain standards.”

“Maybe the Advertising Code Committee can do something.”

“What we need is a kind of dossier that provides information about various aspects of such a product. So, that they can be checked.”

Again, the participants had very diverging views on the role of consumers. On the one hand, some participants emphasized that the producer is responsible for information provision and that there should be control over what the producer does. This control should enable consumers to make informed choices and to check whether certain claims are true.

On the other hand, some participants felt that consumers may reasonably expect that any product sold on the market meets certain minimum standards. The producer should prove that the product does not cause any harm. It is very difficult for a consumer to make the right choices and to assess, for example, the environmental merits of alternative products. As consumers are unable to process all the relevant information, those choices have to be made for them.

Participants who acknowledged their responsibility as a consumer emphasized the need for honest information. In their opinion, there should be a quality assurance of the information, provided not by the producer but by an inde-

pendent agency, because they perceived a fundamental antagonism between consumers and producers.

In both cases the questions on responsibilities resulted in fairly predictable general answers about producers, governments and consumers. However, there were some differences that can be attributed to perceived antagonism (i.e. belief in the existence of opposed interests and goals). In the perception of consumers, GM may be more associated with big companies than nano-technology. In addition, food is a market issue in which the government plays different roles for producers and consumers. The participants were also well aware of the differences between consumers.

The questions did not specifically ask the participants to identify areas where they can and should act themselves. Tentatively, it can be said that consumer responsibilities were delimited by a lower and an upper level. The lower level builds on expectations that any product sold on the market should meet certain minimum standards. The producer should prove that the product does not cause any harm. The upper level should meet individual needs for more transparency through honest product information and a quality assurance of the information, provided by an independent agency. It was also mentioned that the difference between lower and an upper level should not become too large.

5.5

United Kingdom

This chapter provides an overview of the results of the empirical work in the United Kingdom. It aims to summarize the results of the two case-studies (nano and GMO) and to compare these results in each thematic section.

5.5.1

Regulatory frameworks

5.5.1.1

GMO

At the level of production, the UK government secured a voluntary agreement with the GM industry that no crops would be grown commercially in the country until the completion of the Farm Scale Evaluations in 2005 (POST 2004)– the regulation of which is discussed below.

Moving up the value chain, as part of the EU, the UK requires that all animal feeds (approved for use by the EU) containing more than 0.9% GMOs are labelled as such; although despite the widespread use of GM feed, the Food

Standards Agency (FSA), who are responsible for enforcing the GM feed labelling legislation, do not carry out any testing (The Soil Association 2008, p. 4)⁹².

Food for human consumption that contains more than 0.9% GM DNA or protein must also be labelled; whether it is purchased in a supermarket or as a fully processed product ready for consumption, in a restaurant for example (FSA 2003, p. 15). Exceptions to this legislation include food made with the help of genetic modification, such as hard cheese, but also meat and milk from animals fed on GM feed (FSA 2003, p. 15). Indeed, because the use of GM feed for animals (and this is a widespread practice in the UK as reported below in section 2.2.1) does not have to be labelled in British shops, it was concluded by the Soil Association that "currently the only general food label that guarantees the non-use of GM feed is 'organic'" (The Soil Association 2008, p. 5). While previously GMOs not approved in the EU were not allowed at any level in food and feed for sale in the EU, under new exceptions, GM feed can also include trace levels of crops which have no safety approval in Europe (GeneWatch UK na-b). There is no legal requirement to identify agro-fuels employing GM technology at the point of sale, or to publish information about their use during production (GeneWatch UK 2009a, p. 4).

EU Regulation 2092/91 prescribes that organic farmers are not allowed to use GM organisms and product derivatives in organic production (POST 2004, p. 3). In line with this, the UK's Soils Associations Organic certification prohibits the use of GM technology – and requiring organic production to be located more than three kilometres from any GM crops. The organisation has however, raised concerns that the threshold of 0.1% permissible GM content, set by some UK and most European organic certification bodies, is too low, especially where adequate co-existence measures and liability frameworks are missing (POST 2004).

As for other food quality standards in the UK, the basic industry standards, the Little Red Tractor logo, and even "Freedom Foods" regulations, allow the food to be produced with GMOs (The Soil Association 2008, p. 5).

Independent of these private regulations, it is reported that supermarkets initially aimed to label products if GMOs might be present (Loader and Henson 1998, p. 32). In November 1997 the British Retail Consortium launched a voluntary code of conduct under which the own-label products of major UK food retailers would have on-packet information, in a positive format: for example

⁹² Indeed, requirements and compliance are different issues. The Soil Association discovered that there is defiance of this legislation. In a sample of 37 feeds used in the UK, seven contained over the 0.9% GM soya material (five of which actually contained over 80%) without bearing the appropriate label (The Soil Association 2008, p. 4).

stating '*contains genetically modified soya*'⁹³ (Loader and Henson 1998, p. 32; Nunn 2000, p. 251). However, subsequently, retailers have chosen to shun GM ingredients (GM Freeze 2005).

Furthermore, British retailers, acting through the British Retail Consortium, agreed to work with manufacturers in the UK, under the auspices of the Food and Drink Federation (FDF), to devise what is known in shorthand as the BRC-FDF Identity Preserved (IP) standard. This standard was published in digest form in March 2000, when it was available free to members of the British Retail Consortium (Nunn 2000, pp. 251-252), and eventually launched in May 2001 (BRC 2001). The system allows retailers to be sure that products are GM free; and was held up as effective after the GM-free status of tortilla chips in the UK was challenged by Friends of the Earth (Nunn 2000, p. 252). Having said this, the system has not been developed into representation to the end consumer through a GM free label (BRC) – see section 2.3.3.1 below.

Elsewhere, a number of large British supermarket, including Asda, Waitrose, Marks and Spencer, and Sainsbury's, have signed up to the Roundtable on Responsible Soy (RTRS), which will see GM soybean being labelled 'sustainable'(Sirinathsinghji 2011).

5.5.1.2

Nano

As in many other countries in the world, the UK Government has not attempted to produce nano-specific regulations. Instead, the approach has been to utilise existing regulatory frameworks as the basis for a case-by-case and adaptive approach to nano-regulation. It is hoped that in examining materials and products one-by-one can, the incremental development of knowledge can feed into the construction of regulatory frameworks sensitive to commercial application of nanotechnologies – thus allowing effective regulation that will not stifle entrepreneurial development of the next industrial revolution.

Bowman and Hodge (2006) report that nowhere in the world is there a nanotechnology-specific system of regulation and this has been supported in the case of EU regulation and the UK (Stokes 2009, p. 283). Instead, in the regulation of nanotechnology falls to existing provisions designed to manage risks associated with conventional, bulk-sized materials and the EU's consensus case-by-case precautionary approach (European Commission 2006) has been accepted by the UK Government (2005).

Unfortunately, such an approach is exceptionally complex, as given the nature of nanotechnologies, they fall within the remit of a very large number of legis-

⁹³ This decision is founded on consumer research which suggests that consumers prefer the definite 'contains' to the less certain (but more accurate) 'may contain' (Loader and Henson 1998, p. 32).

lative provisions – and specifically in the UK as 60 major pieces of legislation in areas of consumer and environmental protection, and occupational health and safety (Frater 2006). There are also numerous gaps within the existing frameworks which need to be examined (Groves et al. 2008). For example, in the EU, and therefore in the UK, Registration, Evaluation, Authorisation and Restriction of Chemical substance (REACH) regulations (established in June 2007), provide one of the pre-existing frameworks in which nanotechnology can be controlled. However, the fact that REACH assessment is only triggered when a substance is produced in quantities of more than 1 tonne per year may mean that many nano-materials fall outside this framework (Allianz 2007; Wolinsky 2006, p. 860). Whilst the one tonne threshold reflects the fact that the safety of a substance is determined by the volume in which it is produced, it fails to account for particle size and surface area as key determinants of toxicity (HM Government 2005, p. 14). Likewise, use of nanotechnology in clothing falls under EU regulation, and textile manufacturers are legally required to indicate the fibre content of their products. However, there is currently no requirement to explicitly state that the textile contains nano-materials (Stuart 2011).

In the area of food, under EU Regulation on new food ingredients (introduced in 1997 to regulate genetically modified products or those manipulated at a molecular level), any business wishing to add an ingredient to a food that has not been used before, or to employ a new process in the production or processing of a food, has to submit an application to the UK Food Standards Agency (FSA). The application will then be scrutinised by the Advisory Committee on Novel Foods and Processes (ACNFP) – which is a non-statutory, independent body of scientific experts that advises the FSA⁹⁴ – to determine whether the proposed food constitutes a risk to the public⁹⁵. However, the first application for the use of nanotechnology in food has yet to be made (FSA 2010, p. 23). Ultimately, however, the enforcement of any food safety regulation in the UK is a matter for the Local Authorities – with the FSA providing the necessary information and the tools for regulation to be implemented.

In 2004 the UK Government commissioned The Royal Society and Royal Academy of Engineers (RS/RAeng), to investigate Nano-science and nanotechnologies: opportunities and uncertainties (The Royal Society & The Royal Academy of Engineering 2004). The report conceded that given the evidence

⁹⁴ The committee contains a range of expertise including consumer representatives, chemists, plant scientists, human epidemiologists, social scientists and food scientists, and uses the skills of its members to come to an assessment about actual and potential risks (ACNFP na).

⁹⁵ The ACNFP's advice is also passed via the FSA to the European Commission for consideration by other member states before any decision is made on authorisation (FSA 2010, p. 22).

of serious nano-toxicity risks, nano-particles should be treated as new chemicals and subject to new safety assessments before being allowed in consumer products. Amongst other proposals the report also called for the labelling of products containing engineered nano-particles. However, little action was taken.

In November 2006, the Royal Society's Insight Investment and the Nanotechnology Industries Association (NIA) came together to explore the societal and economic impact of the technical, social and commercial uncertainties related to nanotechnologies. One of the main outcomes of the workshop was a unanimous agreement on the requirements for a voluntary Code of Conduct for businesses engaged in nanotechnology (The Royal Society 2006).

In the same year, the UK Department for Environment, Food & Rural Affairs (DEFRA) launched a Voluntary Reporting Scheme. Industry, research organisations and others were invited to provide Government with information on the engineered nano-scale materials with which they are working as a means to guide the development of new regulations. However, the scheme only received three submissions in the first three months – only one of those from within the industry – and 12 in total by 2008 (Bayer 2007, p. 19; Sample 2008); despite the UK Department of Trade and Industry estimating that there were then 372 organisations involved in micro- and nano-manufacturing in the UK (Berger 2007). In the same year the Royal Commission on Environmental Pollution (RCEP 2008) recommended the reporting scheme should become mandatory; and the call was backed by the consumer organisation Which?⁹⁶ (Davies 2008).

In January 2010 the House of Lords Select Committee on Nanotechnology and Food made 32 recommendations to the UK Government (FSA 2010, p. 10). Among these recommendations it was noted that the “blanket labelling of nano-materials on packages is not...the right approach to providing information about the application of nanotechnologies” (HM Government 2009, pp. 71-72). Instead, it was suggested that the FSA develop a database of nano-food and packaging available on the market and also a mandatory, but confidential, database of those nano-materials being researched by the food industry (FSA 2010, p. 10 & 17) – and these calls have also been supported by independent organisations such as the Soil Association who are also pursuing mandatory reporting at the EU level (FSA 2010, p. 17 & 19).

In response, the FSA's work programme will develop a database that will capture intelligence relating to emerging risks, and take up the committee's recommendation that it create and maintain a list of publicly-available food and

⁹⁶ Which? is an organisation that aims to “campaign to get a fairer deal for all consumers and publish expert, unbiased information to help you make the right choice, whatever you're buying” (Which? 2011).

food-packaging products that contain nano-materials approved by the European Food Safety Authority (FSA 2010, p. 11). As recommended this includes all materials that have been approved by the European Food Safety Authority (EFSA), and the FSA will also explore including other materials that might be considered to have nano-scale elements, to allow for the uncertainties of definition of nano-materials in the food context (HM Government 2010a).

Despite this development, a representative of the FSA professed that the recommendation for mandatory reporting of materials in development “was a little bit surprising” (FSA 2010, p. 18). The first reason is that the FSC considers such a scheme might have the effect of diverting research outside the scope of such regulation and of discouraging its development in the UK (FSA 2010, p. 11). The second reason is that there are question marks over how such a scheme might be enforced legally as “there are powers to find out what’s on the market today but not what’s going on behind the closed doors in the research laboratory” (FSA 2010, p. 18). For this reason the FSA considers that new legislation might be required (FSA 2010, p. 11).

Additional difficulties identified in the UK with mandatory reporting schemes include the problems of accurate definition, and the first issue for the FSA is to set criteria for what should be included in the list (FSA 2010, p. 11). UK stakeholders also suggest that mandatory reporting might well drive development out of the UK and make it even harder for UK authorities to maintain adequate knowledge of the sector (FSA 2010, pp. 18-19). Indeed, it is noted that the dispersed nature of ingredient production would make a place based reporting system very difficult to operate accurately (FSA 2010, p. 19). It has already been noted that the existing availability of products in the USA, such as a number of dietary supplements, makes personal imports by UK citizens possible – despite the fact that such deliveries fall outside of the regulation of novel foods (FSA 2010, p. 23). For these reasons, the recommendation to develop a mandatory database of materials in development has been rejected by the UK Government (HM Government 2010a, p. 9). However, in order to increase the likelihood of companies contributing to the database, the FSA has said that it is considering signing confidentiality agreements with food and packaging companies (Harrington 2011).

Additionally, although no further information is available, according to their website, the UK Government’s Food and Environment Research Agency (FERA 2008)...

“has built a database available to government users, which focuses on products manufactured or used in the UK containing the new nano-technology, with details of UK companies, their known products and applications. It also has details of other institutions involved in nano-material R&D in the UK, and an extensive list of companies involved in their manufacture worldwide”.

Speaking more broadly, recommendation 10 of the Lord's select committee was that "Government should ... ensure that all nano-materials used in food products ... fall within the scope of current legislation. The legislation should ... include workable definitions of nano-materials and related concepts". In response, the FSA is working with European Commission and Parliament, as well as other Member States on a revision to the existing regulation on novel foods (Sandy Lawrie Novel Foods Unit Chemical Safety Division).

Aside from these government initiatives, the British Standards Institute (BSI) Committee for Nanotechnologies⁹⁷ (NTI/1) was established in June 2004 to feed into European regulation initiatives; develop formal standards and other standardization documents in the area of nanotechnologies; and to promote their use by industry and other stakeholders (BSI 2011a). BSI representatives also hold both the chair (Dr. Peter Hatto until end 2010) and secretariat (Mr. David I. Hyde) of the International Organisation for Standards (ISO), TC 229 "Nanotechnologies", 9 created in June 2005 (BSI 2011b; Hatto na; ISO 2011). Through these committees it is reported by the BSI that "the UK will be able to support this emerging discipline and use standardization to help ensure its safe and successful global development and growth" (BSI 2011b).

In terms of other private governance initiatives in the UK, in 2008 the Soil Association became the first private certification organisation in the world to ban man-made nano-materials from its certified organic products (cosmetics, food and clothing), on the basis that the technology poses a serious threat to human health (Smithers 2008).

5.5.2

Market situations

5.5.2.1

GM soy products

Despite the lack of commercial scale GM crops grown in the UK, products that incorporate GM technology have still been imported from Europe and other parts of the world. In 2003 the UK Government's FSA declared that three GM foods or ingredients were already available or approved for use in the UK market. These products were:

- GM tomatoes, which were sold only as tomato purée

⁹⁷ The committee, chaired by Dr Peter Hatto, Director of Research for Ionbond Ltd, currently has members from approximately 35 organisations, including trade and industry associations, professional institutions, and academia, industry and government departments/agencies. Membership is planned to increase over time in order to have broad representation from all stakeholder groups. Liaisons are maintained with a wide range of interested organisations.

- GM soya
- GM maize

In addition to these products, many processed foods in the UK, such as biscuits, cooking sauces, and food coatings, might include very low levels of GM soya or maize based ingredients (FSA 2003, p. 14). For example, several other foodstuffs have been confirmed as carrying GM ingredients (see Appendix 1 for examples) and it is estimated that “many caterers use fats and oils derived from genetically modified soybeans, without making consumers aware through labelling as required by law (GMO Compass 2009f); and numerous empirical cases of GM derived oil being used in food outlet without appropriate labelling has been identified by local campaigners (Veggies Catering Campaign na). .

Another area where GM material enters the UK food consumer by the public is through the increasing use of “‘GM-derived’” animal feed ingredients such as maize, soya and oilseed or biofuels. In 2003, about 20% of the raw materials used by UK feed manufacturers and farmers was GM based, although figures were approximate given that exporting countries do not routinely separate their GM and non-GM crops (FSA 2003, p. 14). In 2007, a Soil Association investigation estimated that closer to 60% of the maize and 30% of the soya fed to cows and pigs is GM (The Soil Association 2008, p. 3). The report also confirmed that GM animal feed is also being used to produce much of the meat, dairy and egg products imported into the UK. Therefore, animal products such as meat, milk and eggs, either imported or produced domestically in the UK are very likely, to come from animals that have eaten GM feed.

A report by the Soil Association highlighted dairy and pork production is highly reliant on GM feed and GM feed was also anticipated to be used for raising imported frozen and processed poultry products sold by most retailers (The Soil Association 2008, p. 4), While the UK poultry sector was at the time considered to be the only area where nearly all the supermarkets and the feed industry have made the effort to exclude the use of GM feed (The Soil Association 2008, p. 4), in 2009 the British Poultry Council wrote to the British Retail Consortium to inform them that they would no longer be able to guarantee the absence of GM from early 2010 (GM Freeze 2011c). Likewise, while all of the major supermarkets required that all their own-label eggs were produced with non-GM feed in 2008, except for Iceland (The Soil Association 2008, p. 4), reservation about their ability to trace supply chains by the British Egg Industry led major supermarkets to state that “want to be completely assured that the meat and dairy products they purchase have not been fed on GM animal feed they should only purchase organic certified products” (GM Freeze 2011c). Non-supermarket sales are also likely to have GM material in the food chain even if they are Lion Quality Eggs or even ‘free-range’ (The Soil Association 2008, p. 4).

Apart from the poultry sector, however, it was anticipated in 2008 that most UK supermarkets had taken little action to avoid GM feed (The Soil Association 2008, p. 4) – although it is difficult to ascertain a true account of the situation. In 1998 Iceland, a relatively small multiple food retailer - with 770 stores, and only 1.6 per cent of total UK grocery sales – claimed to be the “first national food retailer in the world to ban genetically modified ingredients from all own brand products” (Iceland Foods 2011; Also see Loader and Henson 1998, p. 33). After criticism that this did not include own brand meat, farmed fish, eggs or dairy products (Gray 2010) the supermarket unannounced in 2000 that it would be selling only GM-free animal products from September 1st (Green Peace 2000; Oakdene Hollins 2007). Marks and Spencer went further, as all of their milk and fresh meat was declared to be derived from non-GM fed animals; although they did not require non-GM feed for their frozen and processed products (Loader and Henson 1998, p. 33). Waitrose, the Co-op and Sainsbury's have offered a few non-organic meat and dairy items produced from non-GM feed (POULTER 2008). Indeed, in 1999 independent research concluded that “Currently no UK food manufacturer knowingly uses any GM ingredients or derivatives” (GM Food News 2000).

However, in more recent times, the stance of UK supermarkets has been in great flux. GM watch dog GM Freeze has noted that while retailers such as Marks and Spencer have maintained certain guarantees up to 2009, others, such as Asda, have been more capricious in their communications (to the public in general and with specific customers) and now state that no guarantees can be made (GM Freeze 2011c). A number of UK shops signed up to the Round Table on Responsible Soy (RTRS) in 2010, which brands GM soy as sustainable (Sirinathsinghji 2011).

In terms of restaurants, a Friends of the Earth survey in 1999 found that three fast food chains - Wimpy, Pizza Express and Domino's Pizza - already believed they were GM-free (BBC 1999). Two others - Burger King and KFC - are in the process of removing all GM ingredients from their products (BBC 1999).

According to GeneWatch UK (GeneWatch UK 2009a, p. 4), evidence suggests that a significant proportion of bio-diesel and bio-ethanol currently on sale is likely to be derived from GM crops.

5.5.2.2

Nanosilver products

There is very little information about the availability of consumer products on the UK market that contain nano-materials. However, a number of reports and investigation suggest that the use of nano-technology in consumer products is already wide spread.

In terms of consumer products produced in the UK The Project on Engineer Nanotechnologies database (PEN 2011b) – which is an inventory of nanotechnology-based consumer products currently available on the world market – suggests there are currently in the region of 75 products which incorporate nano-technology. Based on this information there are 15 distinct products that incorporate nano-silver.

In terms of consumer availability however, a report by Corporation Watch in 2007 identified 87 product lines (which span multiple products) and at least one hundred different products containing nano-material available in the UK (Bayer 2007, p. 12)⁹⁸. A Google “shopping” search conducted in October for the term “nano” (excluding references to the i-Pod music device or Tata car) available for purchase in the UK, returns around 23,000 results. In many instances this term is used as part of a product description to make reference to a small version of a product. However, products in which the term “nano” refers to nano-technology include items such as home textiles, residential furniture, apparel and hard goods (which incorporate textiles such as prams and exterior chairs) which incorporate nano-material based fabric⁹⁹, hair care (such as flat irons and straighteners, curling irons, hair dryers with straightening and curling accessories) and food storage solutions. A search for the more specific term “nano-silver” returns around 4,000 results in the categories of hair care (such as flat irons and straighteners, curling irons, hair dryers with straightening and curling accessories), food storage solutions and chopping boards.

In terms of specific areas where nano-based products have been found, it is considered that the use of titanium dioxide and zinc oxide nano-particles in sunscreens had already become widespread; and in the case of zinc oxide, even before it had been fully assessed as a UV filter (Which? 2008b, p. 2). Nano-materials also feature in a number of other cosmetics, such as foundation creams and moisturisers, available on the UK market (Bayer 2007, p. 12; Which? 2008b). Even companies that brand themselves as ‘green’, such as the Body Shop or Neal's Yard to Green People, use either titanium dioxide or zinc oxide nano-particles in their sunscreens.

Another area in which nano-technology is found to be widespread is clothing and textiles. The Guardian newspaper recently suggested that “the chances are you have some nano-textiles hanging in your wardrobe; wrinkle-free or non-iron garments have been engineered against creasing by coating the fibres with nano-particles. Nanotechnology is also reported to be currently re-

⁹⁸ The list was compiled through web searches, directly contacting companies, and by checking products listed in existing nano-product inventories; and it was noted that the figure was likely to be a vast underestimate.

⁹⁹ Largely produced by the US company Nano-Tex which is reported to dominate the sector (Bayer 2007, p. 13).

sponsible for the stain-resistant fabrics found in both clothing and carpets" (Stuart 2011). This is supported by investigations which have located such technology in products available from high street stores such as GAP, Next and Marks & Spencerm and also used by smaller UK manufacturers such as Schoeller (using Nano-sphere silicon nano-particles), Howies and Sympatex (incorporating "Reflexion" aluminium nano-particles) (Bayer 2007, p. 13). Nano-technology is also reported in waterproof and breathable fabrics used in fleece (Ethical Consumer na-c) and waterproof jackets (Ethical Consumer na-f), walking boots (Ethical Consumer na-e), sleeping bags (Ethical Consumer na-h), rucksacks (Ethical Consumer na-d), and tents (Ethical Consumer na-b) for example.

Another area where nano-technology is prevalent in UK consumer products is in Healthcare, Personal Hygiene and Cleaning Products. Most uses employ antibacterial properties of nano-particle silver. In 2007 Corporation Watch found the most prominent product in this area is Smith and Nephew's Acticoat range of wound dressings (Bayer 2007, p. 13). It was also reported that Transport for London is planning to use a spray-on nano-particle silver/titanium dioxide coating on furnishings on all London Underground trains as an anti-flu measure (ASLEF 2006).

In terms of home goods, several manufacturers of domestic appliances including, Samsung, LG and Daewoo were found to use antibacterial nano-silver in their washing machines, vacuum cleaners, refrigerators and air conditioning units (Bayer 2007). Nano-particles are also used in electronic technology such as screens (Bloom 2008). There are also reports of nano-technology being used in fridges (Ethical Consumer na-g). There are currently products claiming to incorporate Nanotechnology into insulation and also sheet glass for windows (Oakdene Hollins 2007-72).

In the area of transport: The Audi TT uses magnetic nano-particles in shock absorbers in its suspension system and Mercedes Benz use ceramic nano-particles in the ClearCoat finish on the paintwork of many of its luxury cars (Bayer 2007). In addition, Ford, Toyota and General Motors have in the past publicised their use of "nano-composites" in vehicle components connected to the UK market (Bayer 2007). Several 'off the shelf' car polishes including Turtle Wax contain silicon or zinc oxide nano-particles (Bayer 2007).

According to the PEN (2011b) database, there are food and dietary supplement products containing engineered nano-materials and these include nutritionally enhanced cooking oils, chocolate drinks and vitamin supplement. In 2007 it was reported by Corporation Watch that none of these were currently directly available in the UK (Bayer 2007, p. 14) and in 2010, Which reported that "the main food companies now state they are not using nanotechnologies". However, investigation revealed the availability of Solgar's Nutri-nano CoQ10 and Nutri-Nano CoQ-10 Alpha Lipoic Acid food supplements in shops

in the UK – although the manufacturer has denied that it uses “nanotechnology’ in the common or conventional meaning, in our products’” (Which? 2010b, p. 4).

Beyond this however, consumer products containing nano-technology are now certainly available to UK consumers via the internet. For example, Which? (Which? 2010b, p. 4) reports the availability of:

- Nanoceuticals Slim Shake Chocolate by RBC Lifesciences (USA) which has, RBC Lifesciences claim, an improved taste as a result of using nanotechnology; and
- ASAP solution food supplement which contains “engineered silver nano particle mineral supplement’ that improves its ability to kill bacteria”.

In 2007 Corporation Watch reported that it had not been possible to locate the use of nano-technology in food packaging, although it was “considered likely that nano-materials are used in UK food packaging” (Bayer 2007, p. 14).

5.5.3

Public debates

The UK Government has naturally established discourses on both the issues of GMO and nano-technology – although in some cases these have been fractured between competing views of individuals and government departments.

5.5.3.1

GMO debates

UK media suggests that in the past, prominent sections of the UK government, including DEFRA and Tony Blair have been strongly supportive of GM technology (Brown 2004). Indeed, Britain has consistently lobbied in favour of lifting GM bans (Lucas 2010): it tried to end the EU moratorium on growing GM; it was the only EU state to oppose a plan to label food containing minute traces of GM material, and in 2009, it opposed the German ban of Monsanto maize crop. The UK is not in favour of the current EU proposal on national decision-making to ban GM cultivation (NFU 2011).

Between July 2002 and July 2003, the UK Government undertook a national dialogue on GM issues, the results of which are summarised in Figure 14 below.

Strand	Findings
Science – assessing the state of current scientific knowledge on GM crops and foods.	<ul style="list-style-type: none"> – The risk to human health is very low; these crops are unlikely to invade the countryside and become problematic plants; it is unlikely that these crops, if

	<p>consumed, would be toxic to wildlife.</p> <ul style="list-style-type: none"> – There is insufficient information to predict the long-term impact of the herbicide regimes associated with herbicide-tolerant GM crops on wildlife. – The balance of risks and benefits will vary for each GM crop, and therefore case-by case regulation is appropriate. – There is uncertainty in areas such as how readily GM plants might invade new habitats, where more research is needed.
<p>Economics - an evaluation of the potential costs and benefits of GM crops in the UK.</p>	<ul style="list-style-type: none"> – Existing GM crops could offer some advantages to UK Farmers – However, in the short-term, any economic benefit is likely to be limited by negative public attitudes and retailer policies. – The study was that the future of GM crops will depend on the nature of the regulatory system and public attitudes.
<p>A nationwide public debate – to find out what people really think about GM.</p>	<ul style="list-style-type: none"> – People are generally uneasy about GM crops. – There is little support for early commercialisation. – There is a widespread mistrust of government and multi-national companies. – There is a broad desire to know more and for further research to be done.

Figure 14: Results of UK Government Consultation (POST 2004, pp. 1-2)

In November 2003 the Agriculture and Environment Biotechnology Commission (AEBC) recommended that government policy must facilitate consumer choice while allowing UK farmers to respond to demand. In order to achieve this, it recommended (Brown 2004; POST 2004, p. 3):

- Wide separation between GM and conventional crops to prevent cross-contamination.
- A compensation scheme for conventional and organic farmers, underwritten by the government.

It should be noted however, that the Government rejected the recommendation that it should be involved in compensation and insurance for GM production; and ultimately, AEBC was disbanded by The Environment Secretary, Margaret Beckett in 2004 – reportedly “after it repeatedly placed obstacles in the way of government plans to introduce genetically modified crops” (Brown 2004).

In 2009 the Government requested the Foresight Institute, a science and technology think-tank, led by Professor John Beddington, the Government's Chief Scientific Officer, to consider the role of GM crops in addressing how to feed a world population which could rise to nine billion by 2050 (Grice 2009).

In November 2009, the FSA set up an independent steering group¹⁰⁰ to shape and manage a public dialogue on food and the use of genetic modification (FSA 2008). The work was designed to understand public perception of GMOs, especially around potential risks and benefits. It was also designed to identify what information people need and want in order to make confident, informed choices about the food they eat (FSA 2008). However, academics involved in the consultation have resigned on the basis that it was biased in favour of the technology (Vidal 2010).

The strongest government backing for GMO technology in the UK came in 2010 from the new environment secretary, Caroline Spelman (Jowit and Vidal 2010). The minister committed the new coalition to supporting GM technology “in the right circumstances”.

In 1998, The Royal Society produced a report on Genetically Modified Plants for Food Use. The conclusion of which was that while such applications offered benefits in agricultural practice, food quality, nutrition and health, further knowledge on several aspects of GM technology required further consideration. Over ten years later, The Royal Society (The Royal Society 2009) reported on the role of science in delivering a sustainable global food system, in which it was stated that GM technology offered a possible solution to delivering food security.

5.5.3.2

Nano debates

In their 2003 report “Scientific Research: Innovation with Controls”, the UK Government’s Better Regulation Task Force (BRTF)¹⁰¹ identified nanotechnol-

¹⁰⁰ The make up of the group can be found at:

<http://www.food.gov.uk/gmfoods/gm/gmdialogue/gmdialoguemembership/>

¹⁰¹ The Better Regulation Commission independent of any UK Government department but under the oversight of Department for Business, Enterprise and Regulatory Reform. The role of the organisation is “to advise the Government on action to reduce unnecessary regulatory and administrative burdens, and ensure that

ogy as an area of great potential but where concerns are likely to be raised about the risks of the technology. Overall they recommended that the UK Government:

- Enable, through an informed debate, the public to consider the risks for themselves, and help them to make their own decisions by providing suitable information;
- Be open about how it makes decisions, and acknowledge where there are uncertainties;
- Communicate with, and involve as far as possible, the public in the decision making process;
- Ensure it develops two-way communication channels; and
- Take a strong lead over the handling of any risk issues, particularly information provision and policy implementation

These recommendations were accepted in principle by the UK Government, although they saw no obvious focus for an informed public debate of the type suggested by the Task Force (The Royal Society & The Royal Academy of Engineering 2003, p. 1).

In 2007 DEFRA commissioned a report into the areas where nanotechnology could provide beneficial environmental outcomes (Oakdene Hollins 2007, p. 6). While the report was largely positive about the possibilities of nanotechnology, it also highlighted the well known health and environmental risks; and specifically that “the manufacture and end of life treatment of nano-materials [and particularly free nano-particles] could potentially lead to a high risk of exposure across all nanotechnologies, but such exposure can be minimised through the introduction of best working practices” (Oakdene Hollins 2007, p. 12).

In their report the UK Royal Commission on Environmental Pollution (RCEP 2008) recognised that nanotechnology’s potential benefits had been overstated, that taking many nano-applications from the laboratory to a commercial scale was proving very difficult, and that the energy demands, low yields and waste associated with nano-materials manufacture were significant problems. The Royal Commission also emphasised that the potential for nanomaterials to pose serious new toxicity risks remained uncertain. Experts participating in the investigation also estimated the NST community has about a decade to carry out research on the safety of nanotechnology before the use of nano-materials becomes too widely-established for any damage to be halted (Groves 2011, p. 31).

regulation and its enforcement are proportionate, accountable, consistent, transparent and targeted”.

In 2010 the House of Lords Science and Technology Committee that undertook an inquiry into the use of nanotechnology in food, emphasised that nanotechnologies have the potential to deliver “significant benefits” to consumers and that their use is likely to substantially increase over the next decade. However, the issue was likened to that of GM food in that there was concern that the food industry was currently too concerned with avoiding controversy on the subject to effectively communicate the benefits of nanotechnology to consumers (Ghosh 2010).

At the wider scale, the UK Government has indicated its intentions to accept recommendations from both the RCEP (2008) and Lord’s Select Committee (2010) to increase the numbers of specialist toxicologists (UK Government 2010). However, it is suggested that this initiative will be hampered by low levels of investment in the kinds of toxicology research most likely to impact applications of nano-technologies which may cause most public concern (e.g. food) (Groves 2011, p. 32).

A joint contribution from The Royal Society and Royal Academy of Engineering in 2004 highlighted both positive and negative aspects to nanotechnology. While the report concluded that many applications of nanotechnologies introduce no new health, environmental or safety aspects, those that involve free nano particles “do raise health, environmental and safety concerns and their toxicology cannot be inferred from that of particles of the same chemical at larger size” (The Royal Society & The Royal Academy of Engineering 2004, p. 49) As well as possible specific adverse health, environmental and safety impacts, the report highlighted the potential for nanotechnology breakthroughs — as with previous technical breakthroughs — may be inaccessible to poor or marginalised groups particularly where patent protection is too wide (The Royal Society & The Royal Academy of Engineering 2004, pp. 52-53). The Royal Society also maintain other public information resources on the subject of nano-technology.

5.5.4

Interviews with stakeholders

In the UK, stakeholders were unusually difficult to get hold of for an interview. In particular environmental NGOs were carefully guarding their time, probably reflecting the need to focus on core activities in times of severe funding cuts. Among private sector organisations, requested interviewees were more responsive to requests for interviews on nanotechnology than on GMO. Further efforts will be made to increase the number of interviews.

5.5.4.1

GMO

So far, only one interview with a representative from the business, retail and industry sector could be secured. For the respondent, GMO was a regular is-

sue and required a major part of his working time if there is an incidence. He currently dealt with GMO issues around soy and maize in animal feed and previously in rice.

Main concerns/risks and uncertainties relating to nanosilver

The respondent's main concerns were regulation, its application effects on trade and segregation, in particular issues between EU and non-EU countries, particularly in soya and maize; and changing consumer perceptions of GMO.

The respondent did not perceive any health or environmental risks in GM products which are approved or awaiting approval. With regard to non-approved products he felt there were issues around consumer confidence, but that from his organisation's point of view this was a matter of the same risk analysis as any other product.

The respondent had encountered GM-soy in animal food imports. He also mentioned questions around soya in processed products and how to source them and managing the supply chain, given the current non-GMO policy and the need to segregate GM and non-GM products.

Among GM products soy was the biggest concern, but the respondent also mentioned issues around rice, maize and honey.

Dissemination of information: product information through labelling

The respondent rejected the view that GM food product information was necessary to prevent harm, due to risk analysis.

He also felt that labelling is not playing a part in protecting consumers or the environment.

He strongly agreed that the current product information provisions enable consumers to make informed choices.

He also strongly agreed that the current EU and national regulation for GM-labelling enables the consumers to make informed choices.

Perceived role and behaviour of consumers

The respondent strongly agreed that most consumers are not interested in the information provided through GM food labelling. This was because in the UK no GM products are on the shelves.

He also strongly agreed that product labelling is generally trustworthy.

He strongly disagreed with the statement that it would be necessary to know more about consumer perceptions to support the regulatory process. He explained that "the consumer perception is different to the risk analysis. The label allows these perceptions to persist."

He strongly agreed that the current everyday routines of consumers (e.g. when purchasing products) are sufficient to prevent harm from GMOs, to health and/or environment. He said that this was due to no GM products being on the shelves and risk analysis.

The respondent agreed that there was “a connection between health and/or environmental concerns and the consumers’ purchasing behaviour with regard to GM-soy products”. But he said that this connection was based on poor understanding and that consumer perception was not based on evidence.

Regulatory challenges

The respondent was strongly satisfied with the status quo of GMO-labelling in the UK. “Having no GM products on the shelves makes it difficult to say how the labelling would affect consumers. But the current scheme would give consumers all the information they require.” He demanded that animal feed in food products should not be included in the GM labelling scheme, based on the evidence provided by the Food and Safety Agency (FSA) on transmission.

The respondent did not know about any national GMO-labelling scheme which he would like to adopt in the national context.

In response to an open question at the end of the interview, the respondent explained that the

“key thing is the approach of EU regulation and its influence on trade, in particular synchronous approval and low-level presence. Is this approach capable of keeping up with global developments? This is in particular important for animal feed. These are questions of food policy and global trade, of maintaining the livestock industry in the UK and Europe.”

Public engagement and participation

The respondent strongly disagreed with the statement that “European stakeholders in your field give adequate consideration to national points of views of their national counterparts”. He said that the whole debate was “very polarised” and that there was “not a lot of listening across the board at the UK and EU level”.

The respondent strongly agreed with the statement that “national stakeholders like yourself have adequate opportunity to engage in participatory procedures at the European level”. He explained that he had “every opportunity” to discuss issues with the national governments and nations regulator (FSA and DEFRA), and with the European umbrella organisation.

Lessons for nano from GMO

The respondent felt that GMO could learn “nothing” from nano, but “the other way round: Nano could learn from GM about the way information was

provided to consumers. We need to stress the consumer benefits to make these products more acceptable.” He added that “with GM, the benefits to the consumer are not clear. These are more benefits for farmers and sustainable agriculture. This is due to the kind of products that have been developed.”

5.5.4.2

Nano

So far, only three interviews with representatives from the business, retail and industry sector could be secured. All interviewees had come across nanotechnology in food packaging and food, while encounters with nano in other product categories were uneven. For two interviewees, nanotechnology occupied a major part of their work life while for one interviewee it was a marginal issue. For all three nano-silver was part of their dealing with nanotechnology.

Main concerns/risks and uncertainties relating to nanosilver

All respondents were concerned about the developing regulatory framework and in particular about

- possible over-regulation and
- consumer reactions.

One respondent, referring to the ongoing FSA assessment, reflected that “the underlying problem is the lack of toxicological data” for “a proper assessment” and “hence there are speculations about risks”. This was echoed by apprehension expressed by two other respondents that consumer reactions might not be based on scientific assessments but on safety fears.

Overall, the interviewees articulated a trilemma between lack of scientific data for proper risk assessment, concerns about how consumer fears could be contained and how to avoid too burdensome regulation.

The ranking of product categories with regard to health and environmental risks did not result in a coherent picture apart from health concerns in food and food packaging being a particular area of concern.

The respondents as a group had encountered nano-silver in a range of products, but none in cosmetics. The only product category in which all of them had encountered nano-silver was textiles. Other products that were mentioned include tinctures in the pharmaceutical industry, sticking plasters and other medical products.

While one respondent did not perceive any risks related to nano-silver, the two others gave careful answers. One stressed that it was currently not clear whether nano-silver was an active principle and how it worked; the other emphasized that there was currently no sufficient evidence that nano-silver displayed any mechanisms that were functionally different from bulk silver.

Asked whether other nano-materials were more important for their work, one respondent said that all nano-materials for equally important, one said that it depended on the materials' functions, and one remarked that "we never really got to the discussion about differences between nano-materials".

Dissemination of information: product information through labelling

All three respondents agreed that the current rules on product information were sufficient to prevent potential harm for health or the environment from nano-silver.

Asked about the upcoming EU and national regulation for nano-labelling, one respondent emphasized that these would be specific for various applications. The suggested link between labelling and harm prevention was refused.

Opinions about whether the current product information provisions enable consumers to make informed choices differed: one respondent agreed strongly, one tended to agree and one tended to disagree.

Asked whether the upcoming EU and national regulation for nano-labelling will enable consumers to make informed choices, one respondent tended to agree. The other two strongly disagreed, explaining that "labelling had nothing to do with informed choice" and that "the integrity of products is to be considered, not the process – the information is meaningless to consumers".

Perceived role and behaviour of consumers

All three respondents agreed that "most consumers are not interested in the information provided through nano related product labelling".

The statement that "consumers' compliance with product information is crucial to prevent potential harms to health and/or the environment when handling nano-silver products (from purchase to disposal)" was refused by two respondents while one tended to agree.

All three respondents tended to agree that "product labelling was generally trustworthy".

While two respondents strongly agreed that "in general, it would be necessary to know more about consumer perceptions to support the regulatory process", one respondent tended to disagree.

While two respondents tended to agree that "the current everyday routines of consumers (e.g. when purchasing, using or disposing products) are sufficient to prevent harm from nano-products", one respondent had no opinion, asking back how she would know?

Respondents disagreed on whether there was "a connection between health and/or environmental concerns and the consumers' purchasing or handling behaviour with regard to nano-silver products". One respondent would not know, another said the answer depended on a consumer's education and atti-

tudes towards the environment, and the third explained that there was no connection because “the products which are currently in the market are not so that consumers pay a lot attention to them”.

Regulatory challenges

All three respondents were satisfied with the status quo of nano-labelling in the UK and did not seek any modifications. All explained that introducing a simple label would not be helpful. One respondent elaborated that instead of a label, more information about contents, novel functions and altered prices would be necessary. Another respondent added that he strongly disagreed with the currently proposed nano-labelling scheme because in his opinion “one single ingredient on the matrix scale does not bring anything to the consumer. The consumer will ask whether anything is wrong with this. This brings confusion.” The same interviewee found that the current labelling in the amended EU Directive was good: “Contents, conditions of use, storage conditions – that is enough information.” The third respondent explained:

“Altering the existing situation where nano is not explicitly labelled would not improve the situation. Information is available to consumers if they are interested. Our members have discussed with consumers and they do not want more information. Consumers have access to information on websites. Confronting consumers with unexplained information would not be good policy.”

Asked whether they knew about any national nano-labelling which they would like to adopt in the national context, all three interviewees denied. One, however, mentioned an unspecified scheme in France but added that any national labelling scheme had the disadvantage of not being harmonised and hence bringing “confusion, and also barriers of trade”.

In response to an open question at the end of the interview, one respondent elaborated that the current state of knowledge was sufficient and that regulators should make more use of the information provided by industry instead of spending money on academic studies. Decisions were too often made by politicians who responded to popular slogans rather than basing their policies on scientific evidence. The same interviewee pleaded for industry-specific regulation rather than one broad-brush regulation for all the different applications of nano-technology.

This was echoed by another respondent who felt that it was “a good starting point to look at specific materials and modify the regulation with evidence of new scientific data”. The same respondent stressed that it was important to maintain the underlying principles of risk management: “The current regulatory system is robust enough to deal with nano-materials. I agree with the current system of pre-marketing approval, if there are sufficient toxicological data.”

A third respondent emphasized that for his organisation “the distinction between naturally occurring nano products, for example in milk and cheeses, and engineered nano-materials and products, is key”. He suggested that consumers were more interested in the engineered materials and that more information should be made available by the government, referring to a leaflet published by the Irish FSA a few years ago as a good example. “We want to change the perception. This is not a new technology.”

Public engagement and participation

Two respondents tended to agree that “in general, European stakeholders in your field give adequate consideration to points of views of their national counterparts”. Both explained that there were various forums available for open discussion, including European discussions with the European Food Safety Agency and European stakeholders such as Euro Commerce. One respondent strongly disagreed, pointing to the political limitations at the national level and the overwhelming importance given to national politics “on peoples’ own doorstep”.

The same two respondents strongly agreed to the statement that “national stakeholders like yourself have adequate opportunity to engage in participatory procedures at the European level”. One of them pointed to a stakeholder dialogue organised by the European Commission since four years, the other explained that his organisation had “very good relations with the government departments” and “can influence the UK position”, membership in a European umbrella organisation “which talks to the European Commission and the other institutions” and “we could also discuss directly with the Commission”. One respondent tended to disagree with the statement, explaining that while they were only a few hundred meters away from the Commission, European affairs were difficult to understand for people who were not involved on a daily basis.

Lessons for nano from GMO

Asked what could be learned for nano from GMO, all three respondents stressed the differences between the two technologies for the following reasons:

- GMO caused more ethical issues because it was crossing natural boundaries.
- Nanotechnology is an extension of an existing technology.
- In GM certain principles have not been accepted.
- Nanotechnology is an enabling technology that can be applied in various sectors. The spectrum of advantageous applications is much broader. Nano is a general purpose technology like electricity.
- The state of knowledge is better with nano than at the heydays of the

GMO debate.

One respondent stressed that that a lesson to be learned was that “with GMO, the biggest problem for us was the interaction with non-European countries, in particular imports, with the non-zero tolerance policy. Any regulation has to take into account the international context.”

5.5.5

Focus groups

This document gives an overview of the results of the focus groups with consumers in the UK. It aims to summarize the results of the case-studies (nano and GMO) and to compare these results.

5.5.5.1

Participants

Overall, six focus groups – 3 for each technology – were conducted with 44 participants.

A combination of random sampling and self-selection was deployed for participant recruitment. The electoral register served as the most encompassing publicly available household data base, although it notably does not include persons who are not entitled to vote in the UK, who have not registered or who have opted out of the public part of the register. The public part of the electoral register for Cardiff was purchased from Cardiff City Council. Using an excel application, a random selection of 500 addresses was generated from each of Cardiff’s four electoral districts. 2000 invitation letters were sent out, offering a selection of six dates and a reward of 25 pounds for participation. Participants were signed up on a first come first served basis, with a view to create diverse groups if possible, based on age and sex. 10 participants were registered for each of the groups. Due to no-shows, in the end 44 individuals participated across the six groups.

5.5.5.2

Response to the focus groups

The focus group guideline was perceived well. None of the questions appeared to be problematic.

5.5.5.3

Perception and knowledge of the technologies and products

Genetic engineering and its products

GM products were mainly associated with the following four themes:

1. artificial, synthetic or perfected food, convenience, longer shelf life or elimination of disease;
2. health and safety concerns, uncertainty and long-term effects;
3. higher productivity, “feeding the third world” and GMO as an option for farmers “to diversify”;
4. ignorance (“that we might consume GM products without knowing it”).

Ignorance, uncertainty and scepticism were the most frequent and partly dominant responses to GM soy and GM soy margarine. Few participants expected higher productivity from GM soy and nutritional benefits from GM soy margarine.

There were no clear and settled expectations about differences between a GM and a conventional margarine. Many participants did not expect any differences or felt they did not know enough. Four main themes for differences were:

- price (mostly cheaper),
- taste and
- content of the product, e.g., nutritional benefits,
- advantages for producers and along the food chain.

There was insecurity and controversy:

- whether a GM margarine could be expected to be labelled;
- on the environmental impacts.

Nanotechnology and its products

The majority of respondents was very insecure about nanotechnology and nano-products. Most participants either acknowledged ignorance or took up the clue of smallness in mostly generic terms. Nano-products were mostly associated to high-tech (electronics, medicine, research) and rarely to everyday products.

Nano-silver was associated with electronics and computers. Some participants rightly assumed that nano-silver could be used for coatings. Participants appeared to be unaware of already marketed products such as nano silver in washing machines, socks or deodorant.

No participant was aware that nano-silver chopping boards are already on the market, and several participants stated surprise and bewilderment. Participants’ imagination consistently focused on hygiene, cleaning and self-cleaning properties of the product. Understanding of the product was limited, although some participants fully developed the idea that the nano-silver was used as a coating. Expectations about sensual characteristics were varying.

Some fanciful functions (sharpens your knife) and designs (contains electrical components) were imagined.

Comparison

There is a high degree of uncertainty among consumers about both nanotechnology and nano-products. In both cases, some consumers suspect that these products are already used or consumed without knowing.

While nano-products were mostly associated to high-tech (electronics, medicine, research) and rarely to everyday products, GM was linked to various foodstuffs such as vegetables and meat and associated with food designed for convenience, higher productivity, health and safety concerns and consumer ignorance.

Nano-silver turned out to be a more interesting and exciting topic for participants than GM soy. It was associated with electronics and computers and rightly connected with coatings. Responses to GM soy were often dominated by uncertainty and scepticism with some more positive expectations about higher productivity from GM soy and nutritional benefits from GM soy margarine. For both nano-silver and GM soy, participants were widely unaware of already marketed products such as nano-silver in washing machines, socks and deodorant or the current use of GM soy in feed. For both technologies, some participants had a general suspicion that they were already deployed without consumers knowing what was going on.

Participants were not aware of nano-silver chopping boards or GM soy margarine as products. They were often surprised and bewildered about nano-silver chopping boards being already marketed, and disquieted by the idea of GM soy margarine coming on the British market.

Nano-silver chopping boards were associated with a range of consumer benefits, in particular hygiene, and some fanciful functions, while the expectation from GM soy margarine was mostly a lower price, possibly a different taste and maybe nutritional benefits. In both cases, the understanding of the product was limited. Environmental impacts were mentioned as a difference only for the GM product, and even here only rarely.

5.5.5.4

Purchasing criteria

Conventional margarine and GM-margarine

Price, taste and nutritional value are also the most important criteria when purchasing margarine. Process criteria neither featured among the purchasing criteria nor among the perceived differences. The brand was important for more participants than a label; however, several participants stressed that information about the product was important.

Perceived reasons for buying GM margarine was predominantly a cheaper price, but also marketing and advertisement, and to a lesser degree curiosity, fashion, medical reasons, nutritional value and taste. This signals low expectations for consumer benefits from GM margarine apart from a cheaper price.

Perceived reasons for avoiding GM margarine were uncertainty, ignorance and fear about GM food, but also general reservations against GM and the commercial model of food production. Environmental concerns played only a minor role.

Conventional chopping boards and nano-silver chopping boards

For a large majority of participants chopping boards are very important products; for a small minority they are unimportant. When participants described their favourite chopping board, hygiene, colour and design were the most prominent features. Prompted for shopping criteria, price and easily recognizable physical aspects such as weight and size were most prominent, but also a range of hygiene related characteristics.

Most participants were unsure what to expect from a nano-silver chopping board.

When prompted, participants presumed that the nano-silver board would be more expensive and easy to clean, if not self-cleaning, and have an anti-bacterial effect. The nano-product was also assumed to be more fashionable and stylish. Health concerns were discussed at some length, with participants stressing uncertainty about health impacts and citing the experience of asbestos and enamel.

Presumed motives for buying the nano product were: first, a desire to have the latest thing and an interest in the latest technology; second, social distinction and "one-upmanship"; and third, the antibacterial and hygienic features of the product.

Presumed motives for avoiding a nano-silver chopping board were: First, uncertainty about long-term health effects and concerns about the safety of the product; second, a lack of knowledge and understanding of the product; third, scepticism towards new technology in general and a preference for well-known products; fourth, the price if the nano product is more expensive and does not provide visible added benefit; and finally a lack of interest.

In sum, criteria for purchasing a nano-chopping board resonate with the criteria for buying a normal chopping board, i.e. hygiene, price and design. But interest in technology and conspicuous consumption are further presumed motives. At the same time, more conservative consumers tend to be sceptical or not interested. Uncertainty about health impacts and a lack of understanding of the product are potential barriers to purchase.

Comparison

On average, chopping boards were a more important product for participants than margarine. For both, a low price was the most important criterion when buying the product. The brand was more important for margarine than for cutting boards.

For both products, where differences between the nano/GM and a conventional product were expected, they resonated with the most essential shopping criteria. Nano-silver chopping boards were expected to be more expensive but featuring better hygiene and being stylish, which were the second and third most important criteria for buying a cutting board. For GM soy margarine, the expected differences exactly matched the most important shopping criteria, i.e., price, taste and nutritional value. For neither the nano nor the GM product, process criteria featured among the purchasing criteria or the perceived differences. Information and uncertainty are important for both products, but in different ways: For the nano chopping boards, uncertainty about long-term health impacts were a concern among participants; in contrast, for GM margarine, participants wanted information about the product without stressing such concerns, and the brand was important for more participants than a label.

Presumed motives for buying the new technology product differed with much higher expectations for the nano chopping board. The main motives for purchasing a nano chopping board were linked to various expected benefits to the consumer: a desire to have the latest thing, an interest in the newest technology, social distinction and the antibacterial and hygienic features of the product. The perceived reason for buying GM margarine was predominantly a cheaper price, but also marketing and advertisement, and to a much lesser degree curiosity, fashion, medical reasons, nutritional value and taste.

The presumed motives for avoiding a nano-silver chopping board or a GM margarine were very similar: 1) uncertainty, in particular about the health impacts; 2) lack of knowledge and understanding of the product; and 3) scepticism towards new technology or general reservations towards the business model (for GM). Environmental concerns played only a minor role.

5.5.5.5

Consumer Information

Labels: GM-free label and nano-product label

None of the participants had seen this or a similar **GM-free label** before.

Four patterns of response emerged:

- a sense of alarm and creation of awareness, coupled with an Anti-GM message;
- reassurance in the product, mediated by label design, in particular the green colour;

- the label as a guide to avoid unwanted GM food;
- general cynicism and distrust in any label

The label would mostly have a positive or no influence on participants' purchasing decision, but several participants would become more "weary" and "cautious", more information was sought and the trustworthiness of the label was an issue.

The **nano label** was very critically received by participants. The dominant opinion was that the label had no meaning and needed more information and explanation. Participants who tried to attach more content to the label often came up with wrong or over-interpretations. Responses, however, need to be interpreted cautiously because the "cheap" design of the label was regularly mentioned as undermining trust. This was reinforced by perceived inconsistencies between high expectations from a nano-product and the ordinary product at hand.

For most participants the label would not influence their purchasing decision. But while one participant was discouraged, no one was stimulated by the label to buy the product.

More detailed product information

Most participants had not seen the product information "**Contains Oil from genetically modified soybeans**" or similar information before, but two participants were not sure or claimed to have seen a similar label before on a meat product.

The information tended to have a distancing effect. Participants understood that the information highlights a difference between GM and non-GM products; but many participants were insecure about the precise message or wanted more explanation, often from other sources, which indicates scepticism.

The information would have a negative influence on the purchasing decision of the majority of participants. For some participants this depended on whether the information was on the top of the product. Four participants would be more inclined to buy the product because the information has made them curious and has generated interest.

The more detailed product information "**Contains nano-silver**" was perceived to be more attractive and more informative than the previous one. However, the overwhelming opinion was that the information was still not sufficient. In particular, more information was required about nanotechnology, the characteristics and effects of nano-silver. Participants also remarked that the differences and benefits of nano-silver were not communicated. Several partici-

pants felt that the label had no practical meaning for them, and that it was unclear whether this was meant to be an attractor or a warning. Some participants would be enticed by the label to look for more information.

In each group, participants said that they would not trust the label. It was suggested that more trust would be derived from the label being better designed and presented, backed by an approved standard, linked to a renowned brand or the product being sold by a trustworthy outlet.

The label would not influence the purchasing decision of most participants. Some participants felt cautioned and discouraged from buying the product due to insufficient information. For individual participants the label would generate interest in the product.

Website information

Participants perceived the **GMO** compass website as containing a lot of information, but not user friendly and not for consumers, and were looking for clues to assess its trustworthiness.

They responded in four different ways to the website:

- they either became interested and absorbed content;
- they were discouraged by complicated presentation and language;
- they missed information that was clearly linked to their consumption;
- or they even felt intimidated.

Twice as many participants said they would not read the content of such a website as said they would read it. A large minority would visit such a website. Some participants would follow the link from a product package. A minority would look for other sources of information, in particular by searching the internet.

Participants valued that the information was available and acknowledged the effort to provide transparency, but mostly felt that the information was too complicated and technical and not relevant to them personally. As a result, few participants valued the information highly, one third found moderate value in the information, and half of the participants ranked the information low or very low

The large majority of participants said that the website would not influence whether they would buy a GM margarine. Several participants said they would not buy a GM margarine anyway.

A wide range of positive and negative comments on the first impression from the BEUC website on **nano-products** reflect very different styles of internet use. Clearly the “official” and “wordy” website design has a strong impact on user patterns. Participants actively looked for clues whether or not to trust the

website. Information on possible risks from nano-technology was picked up quickly.

A majority of participants would read the content of the website, although in many cases only quickly. About a third of participants would not read the content. Slightly more participants would follow the hint from a product package to such a website than not. However, several participants remarked that they would rather google about the product and that they preferred third party reviews. A few participants did not use a computer.

The 'virtual' product entry was perceived more critical, although there was a consensus that the information was better than on the label. A strong minority felt that the information was useful; others thought the information was not sufficient. A third, smaller group felt "lost among the information". Participants were often critical about the way the information was written and presented. In particular they missed an independent verification of claims and a comment section.

Several features of the content undermined trust in the information provided: an unknown test institute, distrust in the product testing, the information being issued from the company, the product being from China, and information that was perceived as being contradictory.

Several participants in each group expressed little confidence in interpreting the information from the website.

Several participants suggested that they would rather google about the product or that the information should be on the package.

The information provided received very diverse assessments. Almost equal numbers of participants attached a high, medium or low value to the information.

In general, the availability of the information was valued even if participants would not use the website.

A minority would not visit the website, often because they were generally sceptical about nano-products and/or related information. A majority of participants said they would visit the website, some of whom would also look for other information. The very positive result (for the website) has, however, to be interpreted cautiously since it was stated after 90 minutes of intensive discussion.

The website has a potential to influence the purchasing decision of some consumers who valued the information, often becoming more interested in the product. Others who became more interested wanted to look for more information with unclear impact on purchasing behaviour. A second group was "not convinced" or "did not like" the website. One participant decided he would not buy a nano-silver board after reading the information. In two groups, participants said that if the information was presented on the product

package, it would influence them, but they “would not bother” to look at the website.

Comparison

None of the participants had seen these or similar labels before.

The label “without genetic engineering” was received much more favourably. Participants felt much more confident in interpreting this label than the “10-9” label, more reassured about the product and often willing to accept the label as a guide to avoid unwanted GM food. This is consistent with the finding that the “without GM” label would have a positive or no influence on participants’ purchasing decision, while the 10-9” label would not influence purchasing decisions. Both the “no GM” and the “10-9” labels had the effect to raise awareness and make consumers more cautious about the products on the market.

Most participants had not seen this or similar information before, although two participants thought they might have seen similar GM information.

Both the nano and the GM information were perceived to highlight a difference from non-nano or non-GM products, although participants often criticised that this difference was not fully explained. Participants were less confident to interpret the information on nano-silver than the information on GM soy; the nano information was more questioned with regard to its practical meaning and provoked more requests for additional information. However, in both the nano and the GM cases many participants were insecure about the precise meaning and asked for more information, often from independent sources. Lack of trust was more of a problem for the nano information.

The information on nano-silver, with some participants becoming more cautious and others more curious, would have less influence on purchasing decisions than the information on GM soy which would lead the majority of participants to avoid the product.

Responses to both websites were diverse, reflecting different ways of assessing information on the internet.

Both websites were perceived as containing a lot of information, but not being user friendly or not being made for consumers. From both websites participants picked up information quickly, but also looked for clues to assess its trustworthiness.

The information and presentation on both websites was too technical and complicated for most participants, while some participants delved into the content. Both websites failed to offer information that even interested participants could easily link to their own consumption.

A larger share of participants said they would read the content of the BEUC website than the content of the GM compass website, or follow the hint from

a product package to such a website. This might in part reflect the more novel character of nano as opposed to GM technology. On average, also the value of the information on the BEUC website was ranked higher than the value of the information on the GM compass website. This is interesting because at the same time, trust was less of an issue with regard to the GM compass website, while the 'virtual' entry on the BEUC website was very critically examined.

Still, for both websites, participants valued that the information was available and acknowledged the effort to provide transparency, even if they would not use these websites because they found the information too complicated and technical or not personally relevant.

The BEUC website on nano products was more likely to influence purchasing decisions than the GM compass website. The latter would have little effect because participants either missed product related information or would not buy a GM product anyway. In contrast, the web based information on the nano product made numerous participants more interested, while others were "not convinced" or "did not like" the website. The information would be more influential if presented on the product package.

5.5.5.6

Responsibility of actors

a) Responsibility for **GMO** information

On a normative level, the majority of participants think that responsibility should mainly rest with the government and the Food Standards Agency, and to a lesser degree with manufacturers and consumers. In contrast, actual influence is mostly ascribed to manufacturers and consumers. Supermarkets / retailers and media / public opinion / marketing are also perceived as influential. Government and regulation are thought to have some influence, but much less than expected at the normative level.

b) Minimizing environmental impact from **GMOs**

Compared to the previous questions, answers tend to focus more on the demand side of the market and less on the state. Group dynamics shaped the answers with a focus on the state, the supermarkets or consumers and people. The theme was developed around recent issues in the UK, such as free range eggs, packaging, plastic carrier bags and recycling. Participants tended to agree with the proposition that consumers should play a greater role in improving the environmental performance of consumer products, but discussed the prerequisites, in particular reliable information and consumer education, and the limitations of a consumer led approach.

a) Responsibility for product information on **nano**

Responses to the normatively framed question who should be responsible focused on government or government backed agencies and manufacturers. In contrast, actual influence was mainly seen to side with consumers and consumer organizations, marketing and advertisement, and to a lesser degree with regulatory agencies and manufacturers.

b) Responsibility for environmental impact of **nanomaterials** in products

Responses focused on manufacturers, consumers / everyone and government / legislation, and to a lesser degree on retailers and the supply chain. Participants in all three groups discussed in particular packaging and recycling in some depth (this was probably due to the then imminent introduction of a local tax on plastic carrier bags and a new recycling scheme in Cardiff). Various aspects of changing consumer attitudes were raised, such as green consumption attitudes, expectations of responsible consumption, psychology and guilt; practical aspects such as availability, information and product rating; and people having different views on the environment.

a) Responsibility for information **in comparison**

In both the nano and the GM groups, the majority of participants thought that responsibility should mainly rest with the government or government backed agencies. Manufacturers featured more prominently in the nano groups than in the GM groups, while the GM groups paid more attention to consumers.

Both GM and nano groups saw consumers and consumer organizations having much actual influence and government and regulatory agencies having less influence. In the GM groups, the influence of manufacturers featured more prominently than in the nano groups. Both nano and GM groups saw marketing and advertisement as influential, while retailers and supermarkets were more stressed by the GM groups.

b) Minimizing environmental impact **in comparison**

Both the GM and the nano groups focused on consumers and the state, while GM groups paid more attention to retailers and nano groups more to manufacturers. Across all groups, the topic was discussed with regard to packaging, plastic carrier bags and recycling.

Participants across all groups tended to agree that consumers should play a larger role in minimizing environmental impact, and always discussed the necessary prerequisites. While both nano and GM groups addressed the importance of reliable information and consumer education, the GM groups reflected more on the limitations of a consumer led approach, while the nano groups paid more attention to attitudes, norms, psychology and product ratings.

6

Comparison between the countries

The chapter on comparison of the country specifics summarizes the differences and commonalities found in the country studies for each technology.

6.1

GMO

6.1.1

Regulatory frameworks

For the case of GMOs in every country the European regulation applies with regard to the positive labelling scheme “contains GMO” and the thresholds of GMO traces which must not be labelled (0.9%). However, there are possibilities for national leeway, especially for the GMO-free labelling. The analysis showed that the requirements for this label are different in the considered countries.

In Austrian GM-free label and the Netherlands “produced without GMO” label the requirements are considered to be very strict. Germany seems to be in a middle position with its GM-free label. In Finland there is no regulation on a GMO-free label, as well as, in the United Kingdom.

With a view on organic products labels, the Austrian scheme is stricter than in other countries, since the threshold of GMO traces are set to 0.1%. In the other countries the threshold is at 0.9%.

Additionally, there are also various attempts at voluntary labels and policies on GM-free products for example by retailers, food producers along the chain and organic farming groups.

6.1.2

Market situations

To bring the comparison of the national market situation in a context the European situation is shortly reflected.

According to DEFRA (2011b), in 2010 GM crops were grown by around 15 million farmers in 29 countries worldwide; and the area grown has increased steadily year-on-year, reaching about 148 million hectares in 2010. Most current GM crops are insect-resistant or herbicide-tolerant. The main crop species in which these GM traits have been introduced are soya, maize, cotton and oilseed rape; although other crops with different traits are currently being developed, e.g. drought-resistance, disease-resistance, and crops with enhanced nutritional attributes (DEFRA 2011b).

In the EU in 2004, six GM crops have marketing approval for import and processing (POST 2004, p. 2) and only two were approved for commercial

growing (GeneWatch UK na-b): pest-resistant maize (Bt maize) produced by Monsanto and Amflora potato from BASF. 15 GM foods or food ingredients already have EU marketing approval (POST 2004, p. 2) However, in 2008, Maize was the only GM crop currently being grown in Europe (GMO Compass 2008), and by 2011, Spain is the only country to have large scale field production (GMO Compass 2011c). In March 2010 the planting of the GM potato, Amflora, was approved again (with starch to be used in animal feed – although the crop was not approved for human consumption), and the first harvest of 15-hectare began in Germany in September (GMO Compass 2010a, 2010b, 2011a). As a result the company announced plans to apply for approval for two further lines (GMO Compass 2010d). In 2009 further approvals for imports (maize strains MON88017, MON89034 and 59122xNK603 as well as food and feedstuffs produced from these strains) were granted in 2009 (GMO Compass 2009a, 2009b), more came in 2010 when six more genetically modified (GM) maize lines were approved for import (GMO Compass 2010c). There is also evidence that unauthorised products have been sold at one time in the EU as in 2009 The Commission ordered Member States to remove food products derived from Canadian genetically modified linseed from the shelves (GMO Compass 2009c).

According to the GMO Compass Database (GMO Compass 2011b), overall there are 27 plants approved in the EU for use in food and feeding; 21 for important and processing and 1 for cultivation. Of these approvals, 1 was for cotton; 1 was for flowers; 18 for maize 2 for potatoes; 3 for rapeseed; 2 for soya beans; and 1 for sugar beat.

From a variety of 130 GMOs where authorisations are pending or approved, there are currently 38 GMOs authorised to be used in food and/or feed production or as food and/or feed as is in the EU.¹⁰² These are: GM cotton, GM maize, GM bacterial biomass, GM yeast biomass, GM oilseed rape, GM swede-rape, GM starch potato, GM soybean, and GM sugar beet.

The import of soy for feed use is very important for the European market since there is just little cultivation in Europe. In the EU GM soy is authorised to be used in food and feed stuff, as well as food additive. Cultivation of GM soy is not authorised in the EU, but

“the EU is a major importer of soybeans (between 13-18 million tons yearly during 200-2005 period), and of soybean meal (between 17-22 million tons yearly in the same period” (Ceddia Cerezo 2008, 7).

One must bear in mind that the countries of origins are cultivating GM soy almost exclusively. According to the GMO-compass website – a website which provides information about GMOs – the worldwide GM soy adoption rate is

¹⁰² http://ec.europa.eu/food/dyna/gm_register/index_en.cfm and <http://www.gmo-compass.org/eng/gmo/db/>

about 60 %.¹⁰³ The USA, Brazil and Argentina are producing 82% of the world production of soy. The GM soy adoption rates are very high in these countries: In 2010 GM soy is almost exclusively produced in Argentina. The GM soy adoption rate in the USA is approximately 93 % and in Brazil 70% (LEL 2010, 5-6) and is still increasing. In the countries USA and Argentina GM soy must not be marketed separately.

In every country subject to the research project there is just little data on the use of GM soy. Most of this information is based on estimates. Still, the EU is a major importer of GM soy, because of the lack of cultivation, and GM soy is mostly used in feed products throughout Europe.

Austria is the only country with a significant cultivation of soybeans. In comparing the import amount, the Netherlands are on first place, Germany on second and, with a large margin, Finland follows behind. The highest use of GMO-free labels can be found in Austria. Germany and the Netherlands are taking a middle position and in Finland and the United Kingdom there is currently no such label. In Austria, the use of GMOs in products is generally avoided. In Germany GM-soy is present in every fourth soy-related product, but must not be labelled, because of not exceeding the threshold of 0.9%. In Finland generally every fourth maize or soy related product contains GMOs below the threshold and must not be labelled, too. The Netherlands seem to make an exception to this rule: Here, significantly more products are sold with an amount of GM-soy exceeding the threshold and labelled accordingly.

6.1.3

Public Debates

In the considered countries, as well as in Europe in general, there is mostly a negative attitude towards GM food. Media coverage is mostly sceptical and even negative in Austria.

However, the Eurobarometer study on Biotechnology in 2010 stated that 53% of European citizens relate positive effects in the next 20 years to Biotechnology and genetic engineering in general (Eurobarometer 2010a, 12). 20% of the respondents stated that they "don't know", which leads the survey to conclude that the respondents are not very familiar with the role and implications of this technology. The following table shows the differences between the member states subject to the study:

"I am going to read out a list of areas where new technologies are currently developing. For each of these, do you think it will have a positive, a negative or no effect on our way of life the next 20 years?"

¹⁰³ http://www.gmo-compass.org/eng/grocery_shopping/crops/19.genetically_modified_soybean.html

Biotechnology and genetic engineering	Positive	Negative	No effect	Don't know
EU27	53	20	7	20
DE	42	33	7	18
UK	56	16	7	21
AT	35	41	12	12
NL	53	25	13	8
FI	69	15	9	7

Figure 15: Eurobarometer survey on Biotechnology 2010, values in percent

With a special view to food-related risks an Eurobarometer Survey in 2010 on the issue states that two thirds of the European citizens have a higher level of worries in the category “cloning animals for food products” than in the category “genetically modified organisms found in food or drinks”, which is considered to be a medium level of worries (Eurobarometer 2010b, 25).¹⁰⁴ Here the range is very diverse in the member states.

In general GMOs are currently not a hot topic in the national public debates, but it is a long standing public, policy and expert controversy in Europe which is characterised by reactive stakeholder dialogues. The topics cover cultivation, co-existence and bio-economy discourses.

In Germany recurring protest campaigns are carried out mostly by NGOs – for example demonstrations and sabotage of GM crop trials. In Austria the anti-GMO stance is much stronger. The low level of support of GM food and crops is deeply embedded in the attitudes of Austrian publics and the government follows an anti-GMO policy. In contrary there is a more positive attitude towards GMOs in the Netherlands and the United Kingdom. In both countries the government is more supportive towards GMOs. Notably, Finland which is considered to be technology optimistic and also pro Biotechnology are opposing the use of this technology for food application. Especially farmers are against the cultivation of GM crops.

6.1.4

Views of national stakeholders

In total 19 interviews were carried out. The distribution of the interviews with regard to the stakeholder organisations are listed in Figure 16: Distribution of the interviews with regard to the field of action of the stakeholder organisations.

¹⁰⁴ In Austria only the issue is located to a high level of worries.

	Finland	Germany	The Netherlands	United Kingdom
e/hNGO ¹⁰⁵	5	1	1	/
Organic farming organisation	/	2	/	/
Commercial organisation ¹⁰⁶	1	2	4	1
Food label organisation	/	1	/	/
Authority	1	/	/	/

Figure 16: Distribution of the interviews with regard to the field of action of the stakeholder organisations

In the following some difficulties of the questions in the interview guidelines are shortly described:

- Questions with relation to risks had to be specified. For the purpose of the interview the term risk meant “potential hazards based on uncertainties”. This was the case for the ranking of health and environmental risks of GMOs and the question of risks of GM soy. Those questions were strongly criticized in some countries.
- A ranking of GMOs was difficult to make, because of lacking knowledge about hazard potential of GMOs.
- The question about everyday routines of consumers and the prevention of harm was considered unclear by some interviewees, while others strongly disagreed about the relation between harm and consumer routines, and others strongly agreed. This variety of answers gives the impression the question indeed was not clear.
- The question what can GMO learn from nano was not answered by most of the interviewees.

¹⁰⁵ e/hNGO: environmental and health Non-Governmental Organisation.

¹⁰⁶ Commercial organisations are industry and business organisations, such as biotech industries, conventional farming, dairy companies, food industries and food retailers.

6.1.4.1

Main concerns/risks and uncertainties relating to GM soy

Concerns vary widely in the countries and are merely based on uncertainties concerning the direct impacts of GMOs. Additionally, the concerns are more concrete in the field of indirect impacts, for instance cultivation practices in South America and their implication for the rural population.

The issues raised in every country were unpredictability, uncontrollability, irreversibility, inadequate risk assessment and missing long-term studies, loss of freedom of choice, co-existence problems, fear for contamination of organic crops and possible effects on human and the environment, as well as, GMOs are not benefitting the population, but are used to transform the market, despite that consumers do not want GMOs in products. The quality of farming would suffer. Farmers would on the long run unlearn the methods of conventional farming. Moreover, administrative authorisation is strongly influenced by political considerations. On the other side concerns arise in the industry organisations that authorisation and threshold rules are affecting the freedom of occupation and innovation.

- In the Netherlands, the questions about risks are seen as leading questions by the commercial organisations because they do not see grounds for risks.

The request to rank health risks is seen as problematic by most of the interviewees. Rankings are more or less based on the assumption that risks are also resulting of uncertainties. Industrial and commercial organisations tend to the perception that authorised GMOs are safe. The agricultural organisations do not consider health risks as direct problem of GMOs, but on the cultivation practices, these are deriving of spraying techniques or are based on the loss of biodiversity and therefore endangering nutrition sufficiency. Moreover, long term effects like allergies can never be excluded.

- In the UK the main concerns were regulation, its application effects on trade and segregation, in particular issues between EU and non-EU countries, particularly in soya and maize; and changing consumer perceptions of GMO.

Every interviewee is working with GM-soy in some sort (food, feed) and basically as import good. Since GM soy is widely cultivated and used most respondents ranked it in the first place of bearing a risk. The following risks related to GM-soy are mentioned: loss of freedom of choice, loss of biodiversity and unpredictable long term effects, harm because of pesticide use, herbicide resistance, and unknown health risks of built in genes, danger of cross contamination. Moreover, there are additional costs for organic farmers in those

countries because of quality controls (8-10%). The industry organisation states that GM-soy is authorized and safe.

- In Germany, the dairy farmers' organisation stresses the problem of negative publicity of GMO use and the pricing pressure on the market. There is a tension which is also provoked by the labelling practices. The organisation assumes that consumer would likely pay more for non-GMO products if they knew which products are containing or produced from GMOs.

6.1.4.2

The dissemination of information

The interviewees in the different countries had different viewpoint on the question if current product information is in general trustworthy enables consumers to make informed choices with regard to the GM labelling scheme:

- In Germany most stakeholders do not agree that product labelling in general is trustworthy. With regard to GM labelling regulation half of the interviewees stated that it does not enable consumers to make informed choices. One interviewee agreed to that statement by referring to the German GM-free label. The industry organisation even stated that the labelling provisions are misleading.
- In the Netherlands most interviewees agree that in general current product information provisions enable consumers to make informed choices. It is criticized by the NGO (unclear labels) and by the organic farmers (lacking E-numbers; much work to find out what is exactly in a product). The NGO notes this depends on the enforcement (referring to SKAL as a good example). The Biotech organisation stresses that the problem is not the trustworthiness but the understandability of the label.
- In Finland the views are equal if product information in general enables consumers to make informed choices.
- In the UK the respondent strongly agreed that labelling provides for an informed choice to consumers and strongly disagrees that labelling communicates safety issues.

The assumption that consumers are interested in GM specific product information is again considered differently in the countries.

- In Germany and Finland most of the interviewees disagreed to the statement that consumers are not interested in information provided through GM food labelling. The dairy farmers' organisation in Germany assumed that consumers would be even more interested if they would know how many prod-

ucts are related to GMOs. The Biotechnology industry organisation was not sure about this statement.

- In the Netherlands four (out of seven) interviewees agree with the statement that most consumers are not interested in the information provided through GM food labelling. The same applies to the statement of the UK respondent. The two disagreeing interviewees in the Netherlands motivate this with the fact that consumers do not know that GM products are on the market and that conclusions cannot be drawn with so few GM labelled products on the market.

On the question if the GM labelling schemes are satisfying the respondents the views were mixed with regard to the different interest groups on the national level, as well as, the differences of GM-free labels in the different countries.

- In Germany, most of the interviewees disagreed, that the current EU GMO labelling scheme is satisfying. The labelling organisation agrees to the statement by taking into account the German GM-free label which is distributed by them, but they also acknowledge that the label is no substitution for the positive labelling. Therefore, current European labelling scheme is perceived as being not adequate by every interviewee. A positive labelling should be clear and explicit. Moreover, both positive and negative labelling should also take into account the production process. The biotechnology industry organisation even goes further and states that misleading of consumers would stop if also drugs etc. would have to be labelled. Four of the interviewees are not satisfied with the national GMO scheme whereas the interviewees took into account the GM-free label. The biotechnology organisation states that consumers are misled, since the production process is not taken into account properly. GM-free labelling is perceived being in general just a good start but it has to be developed further. However, two organisations are satisfied. One stated that the GM-free label they are distributing fills the gaps of EU regulation as far as possible. Nevertheless, all interviewees stated that the current labelling should be developed further. Four organisations state that a positive labelling would be better. Five stated that the production process should also be taken into account. One organisation issued comprehensibility problems because of too many labels on the market. One organic farming organisation mentions that consumers should be enabled to exercise their purchasing power.
- In the Netherlands four (out of seven) interviewees are content with the current GMO labelling; three interviewees disagree. The disagreement is either because the labelling requirements reflect a strange idea

of reality, e.g. because labelling is already required when there is a very small percentage of mixing (1), and because of a lack of freedom of choice regarding products of animal origin, cotton, bio fuels, vitamins and the 'filling up' of the 0,9% (2). The provision for a label 'made without gene technique' is seen as a national scheme by four interviewees and by others as an EU-scheme with flexibility for Member States. Three interviewees want a more harmonized EU label. The dairy company strongly opposes a national label. The NGO sees too many lacunae in this provision because requirements are too strict and the result is now that it is hardly used; so they conclude there is a lack of freedom of choice here. Changes in the current labelling scheme are wished by two interviewees, for feed, cotton, bio based products and products made with GM micro-organisms. Two are more or less content with the current scheme. Two interviewees suggest ending the labelling scheme because it is a form of process labelling instead of product labelling, or because it should be more rational. Two interviewees mention another labelling scheme which could hold advantages: the German 'GM-free label' is mentioned once and the US system where the producer is free to choose for communication GM or Non GM is mentioned once.

- In Finland respondents were in favour of the strengthening of labelling schemes (with the exception of the industry representative). An idea is presented according to which shops and markets should place potential GM products to a specific compartment. Labelling of meat and egg products based on gm-feeds should be publicly deliberated, and Finland should promote this in the EU. But some disagree (civil servant, industry representative, consumer association's representative): extension of labelling would increase costs (and thus also prices): separation of gm- and non-gm feed is expensive and hard to monitor.
- In the UK the respondent agreed that the current labelling is satisfying and trustworthy.

6.1.4.3

The role of consumers

The behaviour of consumers in abating impacts from GMOs to health or the environment are again very mixed with regard to the differences in the countries.

- In Germany, five of six interviewees do not think that the current everyday routines of consumers are sufficient to prevent harm from GMOs especially to the environment. In contrast, the biotechnology industry organisation tends to agree to the statement. One organisation notices that consumers need more information. Five of six organi-

sations see a link between harm to health or the environment and the consumer's purchasing behaviour regarding GM-soy products. They assume that consumers would not buy and therefore support GMOs. Whereas most of the interviewees (with the exception of the biotechnology organisation) state a link to environmental effects three interviewees also state potential health effects due to uncertainty according to missing long-term studies. Additionally, four interviewees refer to the right to know of consumers. In contrast the biotechnology organisation does not see a link. Consumer behaviour is irrelevant because products on the market are safe.

- In the Netherlands and the UK, the relation between the routines of consumers and the prevention of harm is not only criticized because of the connection between harm and the daily routines but also because harm for the environment is caused in an earlier stage, in the countries of origin. Five out of seven NGOs in the Netherlands disagree with the statement that there is a connection between harm to health and environment and the consumer purchasing behaviour. The NGO refers to the answers given before and the organic farmers note there is a connection in the way that health and environmental concerns are a reason for not choosing GM products.
- In Finland most of the respondents stated that the current every day routines of consumers are not sufficient to prevent harm from GMOs to health or the environment. However, as it comes to the potential role of the consumers in the shaping of our techno-scientific futures, the answers diverged, too. The industry representative noted that minimisation of risks should not be left to the consumers because they make choices on the bases of their emotions. Consumers can be, and have been, manipulated not to make advantage of the new products (or to be disposed even to the idea of them). A more common view: consumers already have power to make a difference and that they should use that power. However, this should not mean that consumers carry responsibility over the minimisation of health and environmental impacts. But the respondents remind that consumers can make choices only in the limits of existing assortments.

6.1.4.4

Regulatory challenges/ response management

In Germany, the statement that it would be necessary to know more about consumer perceptions to support the regulatory process is both agreed and disagreed (3 vs. 3). In contrary, in the Netherlands and the UK the statement that it would be necessary to know more about consumer perceptions to support the regulatory process is either disagreed with, or seen as complex (e.g. difference between consumer and citizen).

In the UK the respondent questioned if the approach of EU regulation and its influence on trade, in particular synchronous approval and low-level presence. Is this approach capable of keeping up with global developments. This is in particular important for animal feed. These are questions of food policy and global trade, of maintaining the livestock industry in the UK and Europe.

6.1.4.5

Public engagement and participation

Nearly all respondents agreed that EU stakeholders give appropriate consideration to viewpoints of national counterparts. Some also notice that there can be difficulties, because agreement is not always possible.

- In Germany, two organisations state that they are opinion leaders because of different reasons. One interviewee noticed that the conventional food lobbies are more powerful than the organic sector. The powers are quiet unbalanced and this should be changed.
- In Finland the representative of the consumers' association mentioned RTRS (Roundtable on responsible soy production) as an important arena for EU wide discussion.
- In the UK the respondent criticised that the whole debate was very polarised and that there was not a lot of listening across the board at the UK and EU level.

The reactions to the statement that national stakeholders have adequate opportunity to engage in participatory procedures at EU level were very mixed.

- In Germany, two organisations did have no opinion, because of lacking knowledge or no ambition to engage at European level. Two interviewees agree on the statement, because everyone has the possibilities to participate. Again, two NGO mentions difficulties based on the spare resources of their organisations in contrary to the resources of the industry lobbies. The biotechnology industry organisation referred to conflicts between them and their European counterpart and disagrees.
- The difficulties mentioned in the Netherlands were overkill of information, huge amount of time it costs to participate and lack of feedback about what is done with the results.
- In the UK the respondent strongly agreed with the statement and explained that he had every opportunity to discuss issues with the national governments and nations regulator (FSA and DEFRA), and with the European umbrella organisation.

6.1.4.6

Lessons for GMO from nano

The question was not answered or answered the other way around.

6.1.5

Views of the consumers

6.1.5.1

Participants

Across the five countries 77 consumers participated in the focus groups, which took place from April to September 2011. The number of groups and participants per country is shown in Figure 17: Number of groups and participants per country.

	Number of groups	Number of participants
Germany	3	17
Austria	1	8
Finland	2	14
The Netherlands	2	12
United Kingdom	3	25

Figure 17: Number of groups and participants per country

In each country, the participants had a heterogeneous background in terms of socio-demographics and profession. In comparison with the countries' population, the focus groups were not representative with regard to age and education, but to a certain extent representative regarding gender. Consumers with a low level of education were underrepresented.

During the GMO discussion it appeared that there were salient differences of opinion between persons with different degrees of sympathy for organic food. This happened in many groups, especially in Germany and the Netherlands, but it was not a planned contrast.

6.1.5.2

Response to the focus groups

In each country, the focus group guideline was an appropriate instrument to get information about the practices and the beliefs of the participants. The most stimulating parts of the guideline were the questions that enabled the participants to tell each other something about their daily practices, as well as, questions accompanied by a product that they could inspect.

Afterwards, nearly all focus groups participants were satisfied with the discussions. They enjoyed to discuss the application of new technologies in products and to have a forum for exchange among consumers, which was regarded as a possibility to make up their minds about the issues discussed.

6.1.5.3

Perception and knowledge of the technology and its products

As already described in the section on nano, in four of the five countries, the specific topics of the focus groups (i.e. type of technology and consumer product) were not disclosed to the participants until the start of the session (Finland being the exception). The perception and knowledge of the participants was measured with special questions at the beginning of the session. Additional responses were obtained with questions on purchasing criteria and consumer information.

In all focus groups, the participants were rather unfamiliar with the technological issues and they had no experience with GMO products on the market. They never considered buying those products intentionally, nor did they know about others' experiences.

All groups were able to give associations with the words GMO products and GM soy.

- In Austria and Germany the associations were predominantly negative and many participants did not appreciate genetic modifications at all.
- In Finland, the Netherlands and the UK, there were also negative associations, but these triggered more positive responses from participants who chose to defend GMO.

Apart from these differences in the degree of negative attitudes, there were many similarities in the types of responses across the countries. The main themes were:

- GM's artificiality.
- Health and safety concerns.
- Higher agricultural productivity.
- Consuming GMO products without knowing it.

The participants with a negative attitude stated that the use of GMOs for food and feed is only benefitting the industry. They also referred to uncertainties relating to human health, animal health, social and environmental effects. Potential negative health impacts resulting from consumption of GMOs in food and feed were mentioned, but this topic was not discussed further. The most prominent negative impacts were related to environmental and social aspects of crop cultivation, such as the use of pesticides.

- Animal health issues were in particular mentioned in Germany.

- In the UK, ignorance and uncertainty were more important reasons for anti-GMO remarks than environmental aspects of crop cultivation.
- In Finland, the self-selection of participants (being aware of the topic of the session) resulted in a certain level of polarisation among them.
- Some German and Finish participants criticized negative media coverage (“there is simply nothing radically new about GM”) and questioned if there were not any advantages for society as a whole.

A number of participants had a neutral stance towards the technology and related products. They were more willing to discuss advantages and disadvantages.

Some participants mentioned advantages of genetic modification, such as herbicide resistance. They also assumed that the modification could lead to higher yields or cheaper products, but were in general not sure about it.

During the discussion, there was some uncertainty among the participants about whether they might consume GM products without knowing it.

“Nobody knows (...). I saw a label stating “without GMOs”, but until now I did not see product information indicating that the product actually contained GMOs” (Germany)

Uncertainty was also induced by the topic of GM-margarine. This product was new to all participants and most of them assumed that it is not on the market in their country. However, some participants remembered the label “*produced without GMOs*” and they were not sure about their assumption.

“I was thinking that there is no GM soy margarine on the German market, but keeping in mind that certain products are labelled as not containing GMOs, I am not sure, now”(Germany)

In general, the question on GM-margarine caused some bewilderment and surprise. It prompted counter-questions but it did not trigger any new connotations.

6.1.5.4

Purchasing criteria

At this point, it should be noted that the focal product of the group discussion, margarine, has some complex characteristics, which are differently appreciated in the five countries. For instance, margarine can be seen as a low cost table spread, a low fat substitute for butter, a 'not-really-natural' product, or an enriched food with added new nutrients or components not normally found in a particular food.

- In Austria, most participants did not use margarine; they responded to the questions as if they would use margarine on a regular basis. In Finland, soy margarine is not sold; the groups talked on foodstuff fats.

- In the Netherlands, Germany and the UK, some participants were very keen about the margarine they use.

The main purchasing criteria were price aspects, taste (different flavours), nutritional value, healthiness, convenience, and brand. A few participants said that they looked at specific ingredients or that they took ethics into account. Some said to prefer margarine from the natural shop, such as soy margarine. Some participants said that they just buy the margarine that is on offer. Apart from the organic consumers, no participant mentioned production processes.

When asked about the differences between margarine and GM margarine, the participants were hesitant because they lacked sufficient knowledge about the issue. Many participants stated that there might be no special differences between GM and non-GM margarine in terms of taste or look.

After some discussion, there were three main themes for positively valued differences, namely price (mostly cheaper), taste (may be more like butter), and content of the product (more fit for people with special dietary requirements). These attributes corresponded to the purchasing criteria of some participants and they said they might buy the GM margarine.

- Also in the countries with a predominantly negative GM attitude (Austria and Germany), there were some participants who acknowledged the correspondence between perceived GM-margarine attributes and their purchase criteria.

“Yes, margarine made from GM soy could be cheaper. This would be a point for me to buy it.” (Germany)

The participants also mentioned negatively valued differences. However, after being asked to imagine they are inside the head of a friend who wants to avoid buying a GM-margarine and to identify her/his motives, the participants had no very specific ideas. Again negative associations, uncertainty and lack of knowledge were mentioned. The users of organic food gave a more specific response to these questions.

“Apart from the fact that it has been genetically modified, they often use more pesticide. Therefore, I prefer organic food.” (The Netherlands)

Overall, the participants were more inclined to discuss the general issue of GMOs and large GMO producers than the specific pros and cons of the focal product. Most participants would try to avoid GM-margarine. Some participants were clearly rejecting the GM-margarine, because they were pro-organic. Some participants would not care about GMOs in margarine and some would give GM-margarine a try.

6.1.5.5

Consumer Information

Just as in the nano case, the questions about consumer information were discussed in three rounds. In rounds one and two a packet of margarine with an on-package label (or a picture of it) was distributed among the participants. In round three, the print out of a website was distributed.

- In Austria, all participants were familiar with **the GM-free label** (the official Austrian one). They were split regarding the label's relevance for their own buying behaviour.
- The specific GM-free label (or the "produced without gene technology" label) was new to nearly all the participants in Germany, Finland, the Netherlands and the UK, although some believed that they had seen a similar label before.

Some participants referred to the organic products label (or bio-label) which is a similar label for products assumed to be produced without genetic engineering. The green coloured label told them that the product was produced without genetic engineering. For them, this implied that it is healthier and likely more expensive as compared to other products.

Some participants saw it just as a marketing term. They were not sure if the label was reliable since the certification requirements and the labelling organisation were not known and not indicated on the product package. Some participants showed distrust in any label.

- In one of the UK groups, the label was seen as a source of anxiety and worry.

"It adds to the culture of almost fear and paranoia that we have with food products anyway" (UK)

Hence, familiarity with and trust of the label played a large role. In the absence of familiarity, additional cues (green colour) and context dependent expectancies (distrust, worry, lack of knowledge on GMO) became important. As a result, some participants would use the label as a shopping aid, some would not.

"If I saw such a label on a product next to other products on the shelf, I would most likely choose this product. As long as I don't know the pros and cons of genetic engineering I would try to avoid products which could have been produced with GMOs." (Germany)

"This would not influence anything since I do not know anything about GMOs." (Germany)

More detailed product information

The second product was a package of margarine, which provided a list of ingredients and the statement “**containing genetically modified soy**” Almost none of the participants had seen this product information before. They were surprised since they assumed that there are no products labelled as containing GMOs on the market in their country.

None of the participants saw this information as a marketing issue or questioned that a product labelled in this manner contained GMOs. Hence, the context-dependent expectancy generated by the list of ingredients and the notion that producers will not disclose negatively valenced information voluntarily contributed to trust in the accuracy of the information.

However, the technical language generated additional questions of a technical nature.

“The first time I would see this product information I would inform myself if this is mandatory product information according to EU-law or the like.”
(Germany)

Also, the technical language generated additional questions about the precise message.

“Can anybody tell me the difference? Anybody?” (UK)

Additionally, most of the participants reported that they would not notice this information since they are not really looking at ingredients lists of margarines. They do not expect to find any relevant information; the product is of low importance and cheap or the type is in general too small to be read by older persons. Yet, offering more on-package information was sometimes seen as a cue that there is more regulatory control on products.

Hence, the statement did not qualify as a shopping aid. But if they knew that the product contained GMOs, most of the participants, with a few exceptions, would not buy it.

Website information

As already mentioned in the section on nano, most participants were familiar with websites that provide product information. They said to use such websites when there is a reason to do that. The reason may be that they want to check something they are worried about or to get more information on something that is novel. Hence, two important factors are the participants’ level of interest in an issue and their trust in sources of information.

With regard to the information presented on the **GMO-compass website**, there were different views.

- Many participants were surprised about the amount of GMO applications available on the market (Germany, Finland).

- Many were impressed or intimidated by the amount of information on the website (UK).
- Many saw this information as too general, because there is no information about product brands (all five countries).
- Many found it difficult to assess whether they can trust this website (all five countries).
- Many made a distinction between point-of-sale information and additional information; they preferred the former (Germany, Austria, the Netherlands).
- A few said that they would follow a link on a product package (UK, Austria).

Overall, the participants valued that the information was available and acknowledged the effort to provide transparency, but mostly felt that the information was too complicated and technical and not relevant to them personally.

6.1.5.6

Responsibility of actors

As already described in the section on nano, the responsibility of actors is a complex and multifaceted concept. It is closely related to the rules, norms and expectations in society that specify the rights and obligations connected with particular roles and relationships. It is also related to the way the underlying problem is understood and the way the process of addressing that problem is perceived.

Just as in the nano case, the problems that the focus groups addressed were (1) ensuring that consumers have sufficient information about products on the market, (2) minimizing the environmental impacts from consumer products, and (3) consumers' role in improving the environmental performance of consumer products, their production and their disposal.

- In the five countries, the underlying problem was understood in different ways, partly as a safety issue and partly as a freedom of choice issue.
- In Austria and Germany, many participants did not appreciate genetic modifications at all; they considered producers, the authorities and in Germany also retailers responsible for labelling requirements that reveal differences between products with and without GMOs. The label "contains GMOs" was considered better than the label "without GMOs".
- In the UK, Finland and the Netherlands, the participants were less strict in their insistence on labelling requirements.

- In the UK and the Netherlands, many participants seemed to believe that the government plays more than one role in influencing the market. In the Netherlands, food was typically seen as a market issue in which the government plays different roles for producers and consumers.

Overall, it should be emphasized that the underlying problem was understood in different ways. These differences had an important impact on the judgment of responsibility. The differences were observed between and within the countries. Within the countries, there were striking differences between those participants who had a preference for organic food and those who preferred conventional food.

Those who preferred conventional food did not perceive any problems with GMOs. They were satisfied with the current situation. In contrast, some critical participants claimed that consumers should have the opportunity to choose and that governments should assure the supply of alternative non-GMO products.

6.2 Nano

6.2.1 Regulatory frameworks

Currently there are no national or European mandatory labelling schemes in force. However, on European level regulatory provisions were adopted which will come into force in the next years.

For nano-products only the German industry implemented voluntary agreements and certification schemes. However, the use of these labels or certification schemes is very poor. Another voluntary approach is applied in the United Kingdom which introduced a voluntary nano products database and reporting scheme but there are no substantial submissions. Additionally the soil association declares its products “without nano”.

In Finland, Austria and the Netherlands there are no national voluntary agreements or covenants.

6.2.2 Market situations

Due to the lack of an official definition of what is considered to be a nanomaterial or nano-product, as well as, the lack of official reporting schemes or product databases, information on national market situations of nanomaterials resp. nano-silver in Europe is lacking. To put the few data which was available into a context the European situation is shortly described. One must bear in mind that different sources were considered to acquire the overview on the

market situation. Those sources are not applying a uniform definition of nanomaterials or nano-products. The purpose of this section is merely to provide an impression of the nano-market in Europe.

The chemical industry produces nanomaterials of metals and oxides of metal, nano-porous materials, organic semiconductors, carbon nano tubes, and nano fibres. The application of nanomaterials finds a wide variety in energy and environmental technologies, automotive industry, medical systems industry, optics, construction industry and consumer products.

Due to the fact, that there is no legal obligation to register or notify the use of nanosilver, its production quantity is not perceivable. The worldwide production quantity of nanosilver was estimated 500 tonnes per year (Müller Nowack 2008, 4448). This estimation was made in 2008.

The most used nanomaterial for consumer products is nano silver. In 2010 BEUC set up an inventory of about 475 products containing or claim to contain nanomaterials (ANEC/BEUC 2010). These products are available on the European market, at least through shipment. Nanosilver is used in food packaging, medical products and devices (e.g. wound care), household and office equipment (e.g. washing machines), paints and lacquers, textiles, and cosmetics. In general, just a few products are labelled containing nanomaterials. Some of those products may contain nanomaterials and some do not. These "nano claims" are not reliable, because of the lack of definitions, inventory and controls. This situation makes identification of nano products on the market difficult (Euractiv 2010).

Unfortunately, the data collected is hardly comparable between the countries. Still, the amount of nano-products on the European market is growing.

6.2.3 **Public Debates**

The analysis of the debates is supported by an evaluation of recent Eurobarometer surveys, namely on Biotechnology and food related risks, both of 2010. In the European public knowledge of nanotechnology is still very low, but the general stance is mostly positive and focuses on the benefits of the technology. However, a public debate merely takes place on an expert level and is not a hot topic in the general public.

The Eurobarometer study 2010 on Biotechnology included a question relating to the perception of European citizens to Nanotechnology. Remarkable 40% were indecisive whether this technology might have positive or negative effects on the way of life in the next 20 years. However, 41% related nanotechnology to a positive effect (Eurobarometer 2010a, 12).

"There is a relatively high proportion of respondents who answer 'don't know' with regard to possible risks associated with nano particles found in

food (16%). This finding suggests a degree of unfamiliarity with this issue among European citizens” (Eurobarometer 2010b, 21).

In comparison to cloned animals for food (high level of worry) and GMOs in food (medium level of worry), nano particles found in food are considered to be a low level of worry in the EU member states (Eurobarometer 2010b, 34).

“Have you ever heard of nanotechnology before?”

	Yes	No
DE	65	35
UK	48	52
AT	47	53
NL	61	39
FI	73	27

Figure 18: Eurobarometer survey on Biotechnology 2010, values in percent

The governments in the considered countries are supporting dialogues and forums which is part of an explorative policy. The debate is characterised by expert debates with proactive stakeholder participation which is often embedded in innovation policy.

There are diverse open and transparent consultation procedures to be found in every considered country. By now, these consultation procedures are subject to the general national approaches to nanotechnology. Here, research plans, communication activities and the like are developed. The comparison showed that action plans are on different levels in their developments.

6.2.4

Views of national stakeholders

In total 20 interviews were carried out. The distribution of the interviews with regard to the stakeholder organisations are listed in Figure 19: Distribution of the interviews with regard to the field of action of the stakeholder organisations.

	Finland	Germany	The Netherlands	United Kingdom
e/hNGO ¹⁰⁷	1	2	3	/
Commercial organisation ¹⁰⁸	2	3	4	3

¹⁰⁷ e/hNGO: environmental and health Non-Governmental Organisation.

¹⁰⁸ Commercial organisations are industry and business organisations.

Researchers	1	/	1	/
-------------	---	---	---	---

Figure 19: Distribution of the interviews with regard to the field of action of the stakeholder organisations

There were several feedbacks on the questionnaire itself:

- The ranking of risks of nanomaterials for health and environment is seen as problematic, because this depends on many circumstances, such as application, exposure, type of material, regulation. It is also seen as a matter for experts. There are still considerable knowledge gaps to clearly state a ranking. As long as there is no considerable knowledge about risks one might also think taking into account other product groups, for example drugs.
- The questions about upcoming EU legislation were difficult to comment, because those answers are based on a gut feeling. The same applies to the trustworthiness of labelling schemes.
- The question what nano can learn from GMO is not answered in most of the countries, apart of the UK. The question seems to be too difficult.
- The questions in which a connection is made between labelling and preventing harm was seen as incorrect. This also accounts for the questions where the connection is made between consumers' compliance with the product information/labelling, when handling nanosilver products and the prevention of harm. Especially the Food industry and the Cosmetics industry point out that products on the market are safe.
- In the question about consumers routines the variety in the answers and comments is that broad that the conclusion could be that the question is not clear.
- Until now nanotechnology and its regulation have generated very little public debate in Finland. A lack of knowledge seems to prevail among both consumers and NGOs. The lack of information and public debate on nanomaterials is evident from the responses. Several uncertain answers ("No opinion") were given for among others the questions concerning the risks of nanosilver and nanomaterials and the current and effective labelling schemes of nano products.

6.2.4.1

Main concerns/risks and uncertainties relating to nanosilver

In every country nearly all the interviewees mentioned the lack of information and the uncertainty concerning impacts to health and the environment with regard to the use of nanomaterials in consumer products as a main concern

(e.g. through bio-accumulation and resistances of harmful bacteria through extensive use; killing of useful bacteria; risk for the sewage water treatment and for surface water). A few interviewees saw the risks as negligible or referred to precautionary measures.

- In Germany, one commercial organisation does not see special risks of nano-silver in comparison with other biocides. Risk assessment's basic rules do also apply adequately to nanomaterials. Therefore nanomaterials should not be treated differently. Moreover, there are also concerns regarding the commercial exploitation of nanomaterials and administrative burdens for the industry (overregulation). Regulatory options need to be assessed adequately to measure economic impacts as well. Others referred to experts. As a specific risk the imports from countries like China are mentioned.
- The same statements were given in the UK, but also they saw risks of commercial exploitation with regard to consumer reactions.

Most interviewees assume that consumers will be most concerned about products used close to the body. As long as the knowledge about risks is lacking one might also think of other products, for example drugs, but just a few mentioned the lack of obligatory product information as a concern.

- Nanosilver seems to be an adequate example to show the lack of risk assessment and regulation debate in Germany against the background of consumer products. Nevertheless, other nanomaterials seem to be more important for the work of the interviewed organisations since there is a considerable amount of unresolved questions.

6.2.4.2

The dissemination of information to consumers

The views of interviewees vary widely when it comes to evaluate the trustworthiness of current nano labelling. The evaluation of the trustworthiness of nanosilver-specific labelling seemed to be problematic, since there is no labelling in place by now. Moreover, the past showed that different labels might be assessed differently (e.g. CE-labels and Bio-labels).

Regarding upcoming EU and national labelling regulation the opinions differ widely about the informed choice for consumers. This could be explained because these regulations (apart from the Cosmetics Regulation) have not yet been established. Moreover, there seem to be different understandings about the role of labelling among stakeholders.

Most stakeholders, apart of the UK stakeholders, were not satisfied with the current nano labelling scheme and stated that it would not give an informed

choice for consumers, since there is currently no considerable nano label or product information in place.

- In Germany and the Netherlands, NGOs stressed that consumers are very interested in nano-related information. In contrary, commercial organisations tend to agree to that statement. They do not see nano specific labelling as important ('there is no danger'). It can be part of the broader labelling. The cosmetics industry refers to the Cosmetics Regulation, which is the only specific labelling regulation to date. Some commercial organisations assumed that the consumer did not care for nano product information by now and agreed that consumers are not interested in nano related product labelling information or did not state an opinion.
- In Finland most interviewees stated that consumers are not interested in nano-specific labelling. This stance needs to be considered against the background of a lack of public debates on the issue, which seemed to be more striking than in Germany or the Netherlands. That is why respondents also advocated for the strengthening of visibility of nano products through labels. The perceived advantages of labelling schemes included the correct use of products, a minimisation of harmful effects and an increase in the awareness of consumers (informed choices) and producers (Producers have the responsibility for product safety) and the subsequent recognition of a need for a public debate and a labelling system.
- In the UK the respondents agreed that the current rules on product information were sufficient to prevent potential harm for health or the environment from nano-silver. However, opinions about whether the current product information provisions enable consumers to make informed choices differed: one respondent agreed strongly, one tended to agree and one tended to disagree.

Additionally, the respondents stated aspects to take into consideration when labelling:

- In the Netherlands the point has been raised that it is not so much a question of not being interested but a matter of not having enough knowledge to handle the information. Another aspect mentioned is that a small group (opinion leaders) does want to know the information on the label.
- In Finland, some disadvantages of labelling were also identified including additional costs and an increase in product prices. The latter was, however, also seen to potentially restrict the unnecessary use of nanomaterials.

- In Germany and the Netherlands NGOs in general argued that at least where risk assessments are lacking due to unresolved questions the consumer needs to know that the product they are buying is at least a nano product. Therefore, they were not satisfied with the current labelling scheme, because there is no labelling scheme (or product register) in place or effective which might satisfy (20). Moreover, a reliable risk assessment should be required.
- In Germany, one commercial organisation stated that in fields where risk assessments are questionable a clear labelling should be implemented. Additionally, the current information schemes were questioned against the background of the complexity of nanomaterials and the current knowledge in the population. The problem is that nano-specific information has to be clear and explicit and this might be problematic because of the complexity of nanotechnology. Other commercial organisations did not comment on that point.
- In the Netherlands, the commercial organisations agree with the current scheme. They did not see nano specific labelling as important ('there is no danger'). It can be part of the broader labelling. The cosmetics industry referred to the Cosmetics Regulation, which is the only specific labelling regulation to date. Although the commercial organisations did not always support the use of labelling of nano information and are afraid of too much labelling, most of them had the viewpoint that information should be on the label when the consumer wants this ('right to know') (20).
- In the UK respondents asked whether the upcoming EU and national regulation for nano-labelling will enable consumers to make informed choices, one respondent tended to agree. The other two strongly disagreed, explaining that labelling had nothing to do with informed choice and that the integrity of products is to be considered, not the process – the information is meaningless to consumers.

In all countries, the interviewees were asked for ideas about introducing alternative labelling schemes or product information schemes from other countries:

- In the Netherlands, mention was made of the MSDS (material safety data sheet, for professional use of chemicals) and of the 'aware code', which was developed for paints as a sort of signal labelling. This 'signal labelling' is mentioned as important and three layers are distinguished: 1. colour codes; 2. list of ingredients; 3. reference to producer website and use of mobile technology, getting information via the barcodes. The commercial organisations emphasize that, when there has to be a labelling system, this should be an EU system.

- In Germany, the UK and Finland, all interviewees did not know a labelling scheme they may implement into the national context.

6.2.4.3

The role of consumers

In general, all interviewees, apart of UK respondents, agree on this broad question about a connection between harm and consumer behaviour regarding products, but most of the stakeholder stressed that the connection should be taken into account carefully, since products on the market need to be safe and responsibility for safety must not be shifted to consumers. This also applied to the special case of nanosilver products. The answers strongly depend on the type of consumer behaviour they have in mind. Some commercial organisations, with the notable exception of the cosmetics industry, agreed that consumers' compliance is crucial to prevent harm when handling nanosilver products. However, the relation between compliance and prevention of harm was strongly criticized by the others.

The views on the importance of knowledge about consumer behaviour therefore varied widely. This implies that the role of information with regard to consumer behaviour in the regulatory process might be unclear and should be different with regard to the different product groups.

- Reflecting the current situation of nano products on the market information and freedom of choice are not always enough. One interviewee in the Netherlands mentioned that most consumers cannot choose, so some products should not be marketed.
- Keeping the different possible applications nanosilver in products in mind, most of the interviewees in Germany disagreed that routines of consumers are suitable to prevent them from negative impact of products. Anyway, products need to be safe to be marketed.
- In Finland particularly the role of consumer behaviour (compliance, handling) in risk prevention divided the views of respondents ("Most consumers are not interested in product labelling information").
- In the UK two respondents stated that labelling had nothing to do with informed choice especially with regard to the process of production. This would be meaningless for consumers. However, two respondents strongly agreed that in general it would be useful to know more about consumers' behaviour. Additionally, one respondent would not know if there is a connection between product impacts and consumer handling and purchasing behaviour, another said the answer depended on a consumer's education and attitudes towards the environment, and the third explained that there was no connection because the products which are currently in the market are not so that consumers pay a lot attention to them.

Some more reflections:

- An NGO in Germany even stressed that production of knowledge about the consumers' handling of risky products could lead to the inadequate perception that risks prevention could be shifted in some sort to consumers. This would be a failure.
- As a lacunae in the present system the role of the retailer in the product information is mentioned by a Dutch interviewee.

6.2.4.4

Regulatory challenges/response management

The government should in first place prevent consumers from harm by allowing the placing of products on the market which are per se safe. Regulations should also take into account product misuses. Those should be avoided and in order to get knowledge about those potential sources of hazards knowledge about consumer behaviour may be used. This was stressed by most stakeholders in all countries.

- One viewpoint in Finland mentioned missing from the public debate was the behaviour of nano[material]s in waste incineration.

Moreover, a distinct consideration of the knowledge about consumers was made in Germany and the Netherlands purchasing and handling behaviour for the purpose of drafting regulations should be made. Here, different product groups and different ways to inform consumers should be considered, as well as the impact of information obligations on the market. To assess economic impacts of information obligation, first, other regulatory problems should be resolved, for example definition of what is nano or what a nano-product might be.

- In the Netherlands, it was mentioned that, in relation to the knowledge gaps, a duty of care should be developed by decision makers. Although it is not mentioned this duty of care might be seen as an aspect of the precautionary principle.

In the UK the respondents found that a simple label might not be useful since it would cause confusion among consumers when there is no explanation. One respondent found that this background information is crucial and it should explain that nanomaterials are not a new technology. One respondent stated that more information about contents, novel functions and altered prices would be necessary. In general, they were satisfied with the current labelling scheme. Additionally, regulation should be industry branch specific.

6.2.4.5

Public engagement and participation

Most interviewees referred to their own situation and conclude that EU stakeholders give adequate consideration to national viewpoints. However, some interviewees mentioned several problems, such as too different viewpoints and conflicting interests; it also depends on the goal and structure of the organisation (sometimes more Europe oriented).

- On the other side budgets and personnel shortage leads to the situation that some German organisations abstain from engaging European organisations or participatory procedures on the EU level.

As far as concerns the negotiating at the EU regulatory level most interviewees mentioned that their views are taken into account by EU stakeholders. There are different ways to engage the European participation processes and European institution in general take into account national organisations view points.

- In the Netherlands three commercial organisations argued the situation is different: they negotiate themselves at the EU regulatory level, or the national organisation follows the EU and sometimes taking into account national views is not possible.
- Nevertheless, to participate on EU level resources are needed and not every national organisation is able to do so. The resources are unequally distributed. As one NGO in Germany mentioned, globally there are just 3 persons working on nano-issues on the side of NGOs.

6.2.4.6

Lessons for nano from GMO

In the UK the respondents stressed the differences of the two technologies and their development. One respondent stressed that that a lesson to be learned was that with GMO, the biggest problem for us was the interaction with non-European countries, in particular imports, with the non-zero tolerance policy. Any regulation has to take into account the international context.

6.2.5

Views of the consumers

6.2.5.1

Participants

Across the five countries 77 consumers participated in the focus groups, which took place from April to September 2011. The number of groups and participants per country is shown in Figure 20: Number of groups and participants per country.

	Number of groups	Number of participants
Germany	3	17
Austria	1	9
Finland	3	19
The Netherlands	2	14
United Kingdom	3	18

Figure 20: Number of groups and participants per country

In each country, the participants had a heterogeneous background in terms of socio-demographics and profession. In comparison with the countries' population, the focus groups were not representative with regard to age and education, but to a certain extent representative regarding gender. Consumers with a low level of education were underrepresented.

Within the countries, there were no planned contrasts between groups of participants. For instance, there were differences between persons who were concerned to a certain extent with the impact of products along their life cycle and persons not referring to those indirect product impacts, but this was an unplanned contrast.

6.2.5.2

Response to the focus groups

In all countries, the focus group guideline was an appropriate instrument to get information about the practices and the beliefs of the participants. The most stimulating parts of the guideline were the questions that enabled the participants to tell each other something about their daily practices, as well as, questions accompanied by a product that they could inspect.

However, there were several questions that assume more familiarity of the participants with nano products than they had. As a result, there was not much response to questions about differences between a nano chopping board and the conventional product, and about a friend who wants to buy or avoid the new technology product.

Afterwards, nearly all focus groups participants were satisfied with the discussions. They enjoyed to discuss the application of new technologies in products and to have a forum for exchange among consumers, which was regarded as a possibility to make up their minds about the issues discussed.

6.2.5.3

Perception and knowledge of the technology and its products

In four of the five countries, the specific topics of the focus groups (i.e. type of technology and consumer product) were not disclosed to the participants until the start of the session (Finland being the exception). The perception and knowledge of the participants was measured with special questions at the beginning of the session. Additional responses were obtained with questions on purchasing criteria and consumer information.

In all focus groups, the participants were rather unfamiliar with the technological issues and they had no experience with nano products on the market. They never considered buying those products intentionally, nor did they know about others' experiences.

The technical definition presented by the facilitator to introduce the topic of nano products and nanotechnology was not enough to explain nanomaterials to the participants. The information about small particles did not stimulate their thoughts. However, after a short discussion among the participants, it appeared that the term "nano" generated some associations with products, such as cosmetics, sun lotion, socks, coatings, and cleaning products.

- In each country, knowledge on nanotechnology was low.
- In Germany, Austria, the Netherlands and Finland, nanomaterials were linked to everyday products.
- In the UK, nanomaterials were primarily linked to high tech products (electronics, computers).
- In each country, nanomaterials were associated with positively valenced functions; the term nano had a positive connotation.
- In Germany and the Netherlands, the term "nano" was seen as an advertising trigger.

Some participants had associations with applications that might not be completely safe.

"But it is unclear what will happen with sun lotion on your skin; it might be harmful if the nano particles penetrate into the skin." (the Netherlands)

A few participants were to a certain extent aware that nanomaterials have the ability to enter the body. During the discussions, one of the participants questioned the retrievability of particles once released to the environment.

"Nano is not retrievable anymore once released to the environment throughout its lifecycle. It is so small, who can remove it? It is not possible. And that is the problem because nobody knows what happens. Where does it accumulate in the body? And we are placing tonnes of it every year on the market." (Germany)

In addition, the term "nano-silver" did not trigger much response.

“I never heard of nanosilver before. Is it a term? Nano-silver?” (Germany)

A few participants could name applications of nano-silver in product groups, for example medical devices, coatings for canteen kitchens, paints or food packaging, deodorants and socks.

- In the UK, most participants followed up ideas on electronics and computers; they appeared to be unaware of nano-silver in washing machines, socks or deodorant.

The question “*What comes to your mind if you think about nano-silver chopping boards?*” prompted different answers. Many participants were completely surprised. A few participants referred to specific nano-silver applications in products mentioned above and repeated the anti-bacterial or hygiene-maintaining function (e.g. textiles, deodorants). Some participants were concerned about the supposed anti-bacterial effects; they did not seem to have a clear mental model of the ways in which bacteria grow and how they can be killed.

“If it kills the bacteria, what will it do to your food?” (The Netherlands)

Overall, some participants knew a little bit about nanotechnology but it was difficult for the focus groups to imagine the pros and cons of nanomaterials in general or nano-silver used in chopping boards.

- In each country, the participants were not aware of nano-silver chopping boards on the market.

6.2.5.4

Purchasing criteria

The focal product of the group discussion, a chopping board, was often seen as important in preparing food in the kitchen, but it had no special salience for most participants.

- Chopping boards were perceived as important in Finland, Austria and the UK, but as relatively unimportant in Germany and the Netherlands.

Most of the participants referred to functionality (size, material, hygiene) as the first criterion that should be fulfilled by a chopping board, as well as, price (“*It is just a chopping board*”), and style (colour, shape).

- In the Netherlands, the participants had very contrasting ideas about the relationship between type of material (glass, wood, plastic) and different aspects of hygiene (easy to clean, should not chip easily).

“Plastic dries much faster than wood, and you will get much less bacteria if the board is dry; wood has to be cleaned by rubbing with salt.” (The Netherlands)

When asked about the differences between conventional chopping boards and nano-silver chopping boards, it appeared that the concept of nano-silver

chopping boards had no obvious associations for most of the participants. However, some of them referred to earlier questions and tried to imagine the advantages of such chopping boards, such as antibacterial effect, smell resistance, or less water and chemicals for cleaning. Some expected the nano-silver board to be more expensive and stylish, or more durable.

In addition to the perceived product attributes, the participants were able to identify various reasons for buying such a product. After being asked to imagine they are inside the head of a friend who wants to buy a nano-silver board and to identify her/his motives, participants mentioned a desire to have the latest technology, social distinction, or being extremely concerned about hygiene.

- The desire to have the latest technology was in particular mentioned in Finland and the UK.

The participants also mentioned negatively valued differences. After being asked to imagine they are inside the head of a friend who wants to avoid buying a nano-silver board and to identify her/his motives, the participants referred to:

- uncertainty about long-term health effects and concerns about the safety of the food-related product (“It is food after all what we are dealing with”);
- a lack of knowledge and understanding of the product,
- scepticism towards new technology in general and a preference for well-known products;
- the price if the nano product is more expensive and does not provide notable added benefit.

A considerable number of participants questioned the usefulness a chopping board with an anti-bacterial effect and also stated concerns with regard to the development of allergies in a sterile environment. Participants who were concerned about hygiene mentioned other ways to reduce the growth of bacteria (e.g. scrubbing and air-drying). A few participants issued concerns about environmental effects.

- In Germany, the UK and the Netherlands, some participants got the impression that this product was pushed by the producer.

Overall, the participants were more inclined to discuss the specific pros and cons of the focal product than the general issue of nanomaterials and nano-silver. However, the perceived product attributes did not correspond to the purchasing criteria of the participants. Almost none of them said that they would consider buying one.

6.2.5.5

Consumer Information

In each country, the questions about consumer information were discussed in three rounds. In rounds one and two a chopping board with an on-package label (or a picture of it) was distributed among the participants. In round three, the print out of a website was distributed.

For nearly all of the participants the **nano label** (the “ten minus nine” logo) attached to a chopping board did not mean anything. They had not seen a similar label before and said that it needed more information and explanation. A few participants recognized the scientific notation “ten minus nine”. It triggered some associations with commercial purposes (“now with nano”).

In the absence of familiarity and established trust, other factors became important for judgments of the label’s diagnostic value. These included additional cues (design of the label) and context dependent expectancies, such as the expectation that nano is expensive and stylish, or expectations based on past experiences with product information.

- In the UK, many saw inconsistencies between expectations of nano being a high end product and the more ordinary appearance of the label.
- In Germany, several participants would like to know more about the nanomaterial used, its effects, and the labelling organization.

Overall, the label did not provide the sort of information consumers needed. As a result, it was not seen as a useful shopping aid (i.e. a cue used by shopping consumers to distinguish the products they want from the products they do not want).

More detailed product information

The second product was a chopping board with the label “**antibacterial, contains nano-silver**” This product information was also unfamiliar but it was perceived as being more informative than the label presented before. For some participants it became clear that the antibacterial effect is achieved through nano-silver. Consumers usually expect such information about distinct attribute claims. However, the overwhelming opinion was that the information was still not sufficient. In particular, more information was required about nano-technology and the characteristics and effects of nano-silver.

“I have the idea as if everything will be full with nano-silver after cutting.”
(Austria)

Participants also remarked that the differences and benefits of nano-silver were not communicated. Several participants felt that the label had no practical meaning for them.

- In the UK and Finland, many wondered whether the product information was meant to be an attractor or a warning.

The question whether this information would influence their choice of a chopping board refuelled the discussion on pros and cons. Several participants said that the label would make them cautious and would discourage them from buying the product due to insufficient information. There were also differences of opinion between participants who said that this label would entice them to look for more information and participants who explicitly would not make any effort to gain more information. Some participants would not care about this information since they are “just buying a chopping board”. Hence, for different reasons, the product information did not qualify as a shopping aid.

Website information

In each country, the participants were familiar with websites that provide product information. They said to use such websites when there is a reason to do that. The reason may be that they want to check something they are worried about or to get more information on something that is novel. Hence, two important factors are the participants’ level of interest in an issue and their trust in sources of information.

The print-out of the screenshot from the BEUC website on nano products generated a wide range of comments, which were both positive and critical. The comments reflected

- a general appreciation of consumer information;
- different styles of internet use;
- different views on whether one would visit the website;
- different views on whether one would specifically search for information on a product, on nano-silver, or on antibacterial properties;
- different views on whether one would want more information on health and safety aspects;
- different views on whether one would follow a hint on a product.

Most of the participants would not search for information on a chopping board before they actually buy one, since it is too much effort for such a simple product. BEUC was not known and they were not sure about the intentions of the organisation.

Overall, the participants were sympathetic to the use of websites to provide product information, but not as a replacement of on-package information, because they would need the information at the point of sale. Some partici-

pants stated that they would avoid nano products in the future, since there seemed to be a considerable amount of uncertainty involved.

6.2.5.6

Responsibility of actors

The responsibility of actors is a complex and multifaceted concept. It is closely related to the rules, norms and expectations in society that specify the rights and obligations connected with particular roles and relationships. It is also related to the way the underlying problem is understood and the way the process of addressing that problem is perceived.

The problems that the focus groups addressed were (1) ensuring that consumers have sufficient information about products on the market, (2) minimizing the environmental impacts from consumer products, and (3) consumers' role in improving the environmental performance of consumer products, their production and their disposal

In the discussion on the responsibilities of the government, producers, consumers, resellers, NGOs and the media different viewpoints were represented. The participants in general assumed that each actor has its responsibilities. They also stated different responsibilities for different purposes: minimizing impacts or assuring safety and providing information for purchasers.

- In each country, the underlying problem was largely understood in the same way, as a safety issue.
- In each country, producers were seen as responsible for product safety and sufficient information provision.
- In each country, the authorities were seen as responsible to set up laws and control for implementation. Also mentioned were carrying out registrations and evaluations, and informing consumers.
- In Germany, Austria, Finland, and the Netherlands, participants stated that producers should be forced to prove that their products are safe and to give sufficient information.
- In the UK and Germany, NGOs (e.g. consumer organizations) and consumer reviews were deemed influential to ensure sufficient information.
- In Germany, Austria, Finland and the Netherlands participants were skeptical about consumers' market power, due to the complexity of the issues and the limited motivation of many consumers to take an active stand.
- In Germany and Finland, the influencing power of the producers ("lobbyism") was perceived as being problematic.

- In Germany, some participants were concerned to a certain extent with the provision of information along the supply chain.

Overall, there were differences between participants who appeared to be reflective consumers and participants who appeared to accept a passive role. The former responded with a reflective attention to the wider implications of their product choices. Another important point of attention was the perceived antagonism between consumers and producers, and the need for honest information.

Nearly all participants stated that the products on the market need to be safe. Additionally, some participants wanted to have the opportunity to choose between conventional products and the new technology products, depending on their trust in governmental organisations or systems of safety evaluation. This opportunity is dependent upon the availability of honest product information.

7

Comparison of the findings between the technologies

The comparison of the findings between the technologies aims at summarizing the differences and commonalities between the aggregated national findings in the chapter above.

7.1

Regulatory frameworks

For both technologies the regulatory frameworks are different, but the underlying principles – safety of products ensured through risk assessment, risk communication and risk management, as well as, informed choice for consumers and functioning of the internal market – are merely the same. In both cases the regulation merely takes place on the EU level.

In the GMO case a “one door, one key” principle is applied, which simplifies the authorisation procedure. GM products above the threshold of 0.9% need to be labelled and there are possibilities for national GM-free labels which are applied under different conditions in the countries.

Nano regulation follows a more specific regulatory approach. Nanomaterials are authorised under specific regulations (for example REACH, Cosmetics Regulation or Biocides Regulation) and the specific labelling rules are set up in segregated sectoral laws depending on the actual application of nanomaterials in products. National leeway is currently not used in the considered countries, apart of voluntary agreements. There is no nano-free label.

7.2

Market situations

The market situations for both technologies are difficult to perceive, since there is no substantial data publicly available.

With regard to consumer products on the market it can be assumed that there are just a few which are labelled and therefore perceived by consumers. This is due to the threshold rules in the GMO case and the general avoidance of GMOs above the threshold in products, which does not apply to the market in the Netherlands, respectively, or the GM soy used as feed, but which is also not perceived by consumers, since related products of animal origin need not to be labelled.

For nano labelling rules are currently not in force. The products perceived are at least subject to nano-claims which are not verifiable. Additionally, just a few products in the field of kitchenware or foodstuffs are labelled containing nano-silver. Nevertheless, the situation might change in the upcoming years.

7.3

Public Debates

Both technologies are not a hot topic in the considered countries. But, the press coverage for GMOs is in general negative in contrary to the coverage about nano, which is more positive and focussing on the benefits. For both technologies a substantial public debate which reaches out to consumers is not perceived.

For GMO there is a long standing public, policy and expert controversy which is characterised by reactive stakeholder dialogues. The topics currently are GMO crop trials, cultivation, co-existence, and bio-economy discourses.

Nano debates are at their beginning in the considered countries. There are government supported dialogues and forums which are part of the explorative policy. Those are merely expert debates with proactive stakeholder participation. Debates are often embedded in innovation policy.

7.4

Views of national stakeholders

For both technologies the views on risks and benefits, the necessity and sufficiency of consumer information, as well as, the role of consumer information are very different. Apparently, this is due to different understanding of purpose of product information, the varying perception of consumer information demands, as well as, different traditions in labelling.

Risks are understood differently and the acceptance of **risks** with regard to the **benefits** is assessed differently as well. There are especially different views according to the different stakeholder organisation clientele. The range of views is therefore very broad.

For GM soy uncertainties are still a thread for specific stakeholder groups in contrary, some stakeholder groups do not perceive any risks of GM soy, especially when they are authorised. There are also still controversies with regard to the benefits. In contrary to the nano-case risks stated for GM soy were also of ethical or moral nature touching the cultivation practices in South America. Depending on the perceived consumer demands in product information, the stakeholders were either in favour or against technology-related information and subsequently assessing the current European or national regulatory framework as being sufficient or not sufficient, especially with a view on information relating to the production process.

For nano uncertainties are prevailing and also acknowledged by the stakeholders, whereas specific groups are advocating for a more precautionary approach some stakeholders are more relaxed and state that the current regulatory regimes are sufficient to abate the risks and inform consumers. In general, benefits are acknowledged but how to exploit them correctly the re-

spondents have different ideas. Interestingly the demand to label production processes was not expressed.

For both cases, the respondents agreed that products need to be safe, but they disagreed on the ways **product information** can lead to informed choice, as well as, if consumers are interested in such information.

In general **participation on EU level** is feasible for the stakeholder organisation, but difficulties arise due to the lack of resources, the amount of information which needs to be taken into account to properly engage participation procedure, as well as, differing views of national organisations and European umbrella organisations.

7.5

Views of consumers

Comparison of the findings from the focus groups with consumers across both technologies reveals many commonalities with regard to the underlying consumer concerns, but also significant differences in the perception of the technologies. Most importantly, the findings help us to distinguish between different patterns of consumer responses to new technologies which require a multi-faceted regulatory approach.

7.5.1

Perception and knowledge about the technologies

Respondents in all five countries were neither familiar with nanotechnology nor with the technological issues of GMO. They had no experience with either GMO or nano-products. While all groups provided some spontaneous associations with the words GMO and GM soy, “nano” triggered product-related associations only after some discussion.

While “nano” was mainly linked to positive connotations, GM provoked predominantly negative responses in Austria and Germany and controversial reactions in Finland, the Netherland and the UK. While both “nano” and “GMO” were met with concerns about consumer safety, the artificial character of the technology was an issue only for GMO. Uncertainty, lack of knowledge and the suspicion that the technologies were already used without the consumers’ knowledge was a theme across both technologies. Negative environmental and social impacts were prominent issues for GMOs, but not for nanotechnology. The encounter with specific products – nano-silver chopping boards and GMO margarine – often triggered surprise and bewilderment but no new connotations.

7.5.2

Purchasing criteria

Accounting for the differences between the two focal products (chopping boards and margarine), the dominant consumer preferences were similarly structured around the dimensions price, functionality and health. Price was a key purchasing criteria for both products. Functionality in terms of size, material and hygiene was the first criterion for chopping boards. For margarine, nutritional value and convenience were important functionality criteria. Health considerations were a very prominent motive for purchasing margarine, while the health dimension was expressed as consideration of hygiene when buying a chopping board. Aesthetics and style were important only for chopping boards, while margarine was not at all associated with style or fashion, but with taste as an often problematic aspect of the product. The production process was rarely mentioned as a criterion and mattered only for consumers of organic margarine.

When asked about differences between the conventional and the nano- or GMO-product respectively, the nano chopping board was met with a range of positive imaginations while participants did not expect GMO margarine to differ much from a conventional one. When prompted for possible reasons to buy a nano-chopping board or GMO margarine, the nano product was associated with a range of improved functionalities, fashion, style and social distinction and the GM margarine with lower price, better taste and improved content. Asked for possible reasons to avoid the novel product, uncertainty about long-term health effects, lack of knowledge and understanding of the product and scepticism towards the new technology were the main themes both for the nano- and the GMO product.

An interesting difference was that participants in the nanotechnology groups were more engaged when discussing the specific product than the generic technology, while participants in the GMO groups were more inclined to discuss GM technology in general than the specific product.

7.5.3

Consumer information

Among the labels presented, only the "GMO-free"-label was familiar to some participants, and only so in Austria. The blunt nano label (" 10^{-9} ") and the "GMO-free"-label were received very critically, lacking familiarity and trust, and participants looked for clues in the label design and the product context in order to interpret the meaning. For some participants the labels generated a demand for more information, others felt that the labels were creating anxiety by pointing to something unknown.

The labels "contains nano-silver" and "contains genetically modified soy" were received more positively although the information provided was still

dominantly judged to be insufficient. Participants felt in particular that differences and benefits were not clearly communicated. While the nano-label would encourage some participants to buy the product and help others to avoid it, most participants would not purchase the margarine product if they noticed the GMO-label.

In comparison to the labels, the website information for both products received the most positive response. Different responses revealed different styles in internet use – or a lack of experience with the internet. A majority of participants in all groups were familiar with the use of similar web information. Actual use, however, would depend on an interest in the product and trust in the source. Many participants either critically examined the information provided or rejected it as being too technical and not relevant to the specific product and purchasing decision. While the availability of information on the internet was mostly valued, many consumers preferred product information on the product or at least at the point of sale.

7.5.4

Responsibility of actors

The responsibility of actors for consumer information, environmental and consumer safety is a complex and multifaceted concept and related to, *inter alia*, institutional frameworks, cultural understandings and problem perceptions. Accordingly, consumer responses varied considerably across and within countries.

In all five countries, the underlying problem for both technologies was perceived as a safety issue and also as partly an issue of freedom of choice, the latter issue receiving significantly more emphasis in some GMO groups.

The general picture was that focus group participants saw producers responsible for product safety and provision of sufficient information, and the government and state agencies as responsible for setting and implementing safety standards. Some groups discussed the role of the state in ensuring that sufficient and correct information was provided.

In the German and Austrian groups on GMO, with their comparatively strong opposition against GMO, the role of the government in ensuring product information and establishing labelling requirements was more emphasised.

Expectations about the influence of consumers differed with some participants feeling overwhelmed by issue complexity and corporate power. Some participants also doubted whether consumers would be motivated to act on behalf of environmental concerns. Opinions also differed whether the national and European state were trusted to protect the consumer interest. NGOs such as consumer organizations were deemed influential in some countries but figured less prominent in others.

7.5.5

Conclusion

The large majority of consumers who participated on our focus groups in the five countries felt overwhelmed by the novelty and complexity of new technologies such as nanotechnology and GMOs. Almost all participants struggled to understand the technological aspects of the subject. Most consumers therefore felt uncertain about the characteristics and effects of products that are produced by these novel technologies.

As a result, consumers frequently remarked that they needed to rely on the institutional framework to guarantee the safety of any product entering the market. Consumers responded to this situation displaying different attitudes. A first group showed an almost fatalist attitude, distrusting both producers and the state agencies but implicitly relying on the institutional framework to guarantee their health and safety. A second group felt more positive about the safety guarantees provided by the interplay of producers, legislation and state controls and asked little further questions about the products on the market. A third group relied on the existing framework but demanded more information about products and processes, often taking an active role in critically assessing products and providing for a larger role of public debate and NGOs. This group emphasised principles of consumer choice and consumers' right to know and sought a more active role of the state in ensuring market transparency and the provision of correct information by producers.

These different groups of consumers require different regulatory responses to address their anxieties and to satisfy their ambitions and demands. We will further discuss the need for a multi-faceted regulatory approach in the conclusion (see chapter 9) and recommendation chapters (see chapter 11).

8

The views of EU stakeholder

In order to integrate the perspective of stakeholders at the European level, two workshops in Brussels were organised. The first one was held in February 2011 in order to discuss the findings from interviews with stakeholders at the national level. The workshop results were also taken into account when designing the focus groups with consumers that were carried out in the UK, the Netherlands, Finland, Austria and Germany in summer 2011.

The second workshop was held in November 2011 and mainly discussed the findings from the consumer focus groups, but also the draft conclusions and policy recommendations.

8.1

First workshop with stakeholders in Brussels

The first workshop with stakeholders in Brussels was held in February 2011 and aimed to discuss several aspects of regulation in both GMO and nanotechnology:

- Regulatory objectives;
- the role of the precautionary principle;
- consumer information;
- arrangements for public and stakeholder participation.

The project team identified more than 50 relevant stakeholder organisations and invited their representatives to the workshop. Nine representatives agreed to participate. Due to large scale strike action in Brussels on the day, only five participants attended the half day workshop. The following stakeholder organisations were represented:

- European Consumer Organisation (BEUC)
- European Environmental Bureau (EEB)
- European Organisation for Biotechnology (EuropaBIO)
- Association of Groups of Independent Retailers Europe (UGAL)
- an independent private consultant in the field of societal aspects of life sciences

The discussions were lively and open minded and helped to clarify a range of important arguments. On reflection participants noted that the open atmosphere had allowed them to frankly explain the reasoning supporting their views.

The discussions at the workshop were recorded and transcribed and a condensed protocol was sent to the participants for approval.

We now turn to the main findings from the workshop.

8.1.1

Regulatory objectives

At the beginning of the workshop the participants were invited to comment on a list of regulatory objectives for the regulation of nano and GMO materials and products that had been compiled by the research team and included:

- Protection of human life and health,
- animal health and welfare,
- protection of the environment,
- protection of consumer interest¹⁰⁹,
- occupational health,
- effective functioning of the single market,
- accurate information to operators.

In this context, one participant, referring to an ongoing evaluation on behalf of the European Commission, pointed to an implementation gap. He stated that there was nothing wrong with the legislative text and that “there are no major gaps or misinterpretation possible”. However, he continued:

“it is not implemented as it was written down and that is because of a broad range of reasons, mainly political ones. So we have a very theoretical discussion about what is specified – and something completely different if we look at the practice today. That is the reality when we look also at the objectives and regulations.”

Participants were invited to add their own regulatory objectives. The following aims were suggested:

- **Responsibility:** “The legal mechanism is to make sure that this is actually working once the legislation is in place – so, implementation, enforcement, also maybe liability, and this kind of issues.” The participant called for a clarification about who is going to pay if damage to human health occurs.
- **Participation:** A participant stated that “we can have something on also getting views on the public.” Participation as a goal was backed by reference to the fact that the EU was funding research on public participation in technology development. One participant suggested that the focus of the discussion should be broadened beyond regulation to include issues of governance, adding that participation “is not really a goal of regulation but it is part of the governance surrounding the regulation.”

¹⁰⁹ Such as informed choice, fair transactions etc.

- **Compliance with WTO rules** was added as an aim because “some of the GM regulation, more recently, has been born out of a – not a desire, but a requirement to comply with international obligations.” The participant explained that European GM regulation had to be amended because the European moratorium on GM imports had not been in compliance with WTO law that is why the regulation changed.
- **Differentiation:** A discussion emerged around the moves of several regions to declare themselves GMO-free for political or cultural reasons. It was pointed out that such a scheme created tensions with the principles of the European single market. One participant suggested that this might also become an issue for nanotechnology: “I haven't seen anything of that kind yet in nanotechnology. But it might happen. So there is all this moral and cultural diversity in Europe which is conflicting with the goal of a single market somehow. That is a constant tension.” After some discussion about the right term (“national and cultural identity”, “policy space for cultural diversity in member states”) the group agreed on “differentiation”.
- **Benefits:** One participant, referring to the discussions about good governance, criticised that “there is an exclusive focus on the risk – and benefit needs to be taken into the equation”. The participant felt that the cost of regulation and non-action were often neglected: “When there is an exclusive focus on the risk, and that can be the case in the nano-tech debate or the GM debate, you tend to lose sight of what is the cost of discussing these things forever, or cost of not acting or the cost of banning.” The participant, however, did not call for an encompassing cost-benefit analysis with requirements for the creation of data on benefits as well as on risks, because that would “just increase the regulatory burden”, instead, he felt that “in the mind of policy makers there needs to be a clear understanding that there is a balance between risks and between benefits.”
- **Impact on SMEs:** Particular attention was paid to the regulatory costs for small and medium sized enterprises (SMEs) which participants argued contributed to a concentration of market power: “At present the costs of the regulatory system in GMOs are that high that it is impossible for small companies to enter the market with their products. So the big companies can afford it and compete out the small ones.”

The participants were then asked to rank the regulatory objectives according to their importance. The results are presented in Figure 21: Regulatory objectives and their ranking.

Objective	GMO				Nano			
	Very important	Important	less important	unimportant	Very important	important	less important	unimportant
Protection of human life and health	5				5			
Animal health and welfare	2	3			2	3		
Protection of the environment	4	1			3	2		
Protection of consumer interest ¹¹⁰	3	2			4	1		
Occupational health	2	3			5			
Effective functioning of the single market		4	1		1	3	1	
Accurate information to operators	3	2			4	1		
Additional regulatory objectives by participants:								
Responsibility	4	1			4	1		
Participation	1	1	3		1		4	
Compliance with WTO		5				5		
Differentiation			3	2		1	1	3
Benefits	2	3			3	2		
Impact on SMEs	2	1	2		1	3	1	

Figure 21: Regulatory objectives and their ranking

When interpreting the ranking, participants felt that it appeared to reflect a general consensus amongst them about the set of regulatory aims, and that differences referred to different ideas about the best ways to achieve the aims.¹¹¹

In general, the importance attributed to the various regulatory aims was consistent across both technologies. However, on aggregate participants put slightly more emphasis on “occupational health”, “consumer interests”, “effective functioning of the single market” and “accurate information to operators” for nanotechnology, and more importance on “environmental protection” and “participation” for GMOs. The most significant difference was the very high ranking for “occupational health” in nanotechnology regulation.

¹¹⁰ Such as informed choice, fair transactions etc.

¹¹¹ It should be mentioned that there was no animal welfare groups present at the workshop, which would probably resulted in a diverse ranking.

The largest spread of opinions was displayed on the aims “participation”, “differentiation”, “functioning of the single market” and “impact on SMEs”.

Participants interpreted the findings as follows:

- **Occupational health and environmental protection:** The higher ranking for occupational health in nanotechnology and for the environment in GMOs was supposed to “come out of a perception that nanotechnology is more linked to factory environments and that the link to the environment is less direct than for the case of biotechnology”. One participant felt that there was a “tendency to forget about applications of biotechnology in laboratories or enzyme factories”.
- **Consumer concerns, safety and informed choice:** Participants commented that many consumers believed that labelling was linked to “safety issues against the background of uncertainties of new technologies”, whereas the legislator’s intention for labelling was merely to ensure “informed choice”.
- **Differentiation and effective functioning of a single market:** Participants remarked that possibilities for differentiation at the level of member states or below needed to be carefully evaluated. One participant argued that the experience with GMO showed that the regulatory burden had a negative impact on the effective functioning of the single market. One participant criticised that the GM-free labels and their different application in Austria and Germany could be misleading to consumers who travel across borders. It was again stressed that differentiation would increase the regulatory burden with particular disadvantages for SMEs. The high concentration in the market for GMOs was mentioned as a point in place. Participants demanded that the regulation of nanomaterials and nano-products should take these issues into account.

8.1.2

Precautionary principle and nanotechnology

The respondents were asked to discuss how the precautionary principle should be applied to the regulation of nanotechnology. The emerging debate turned out to be controversial.

Some participants considered the precautionary principle as a guiding principle that called for specific regulatory means based on evidence and which should be applied on a case-by-case basis. Others questioned the sense of such a case-by-case approach especially with regard to the application of nanotechnologies in food-related products. One participant argued that a moratorium for nano-products until a sound risk assessment had been carried out could increase the pressure on industry to develop appropriate testing methods. Some participants who in principle favoured a stricter application of

the precautionary principle were also afraid of possible impacts on the markets. Some respondents suggested that the application of alternative concepts, for example the ALARA-principle¹¹², could be useful to manage the burden of proof placed on the industry and improve the impact on innovation.

8.1.3

The role of nano-related consumer information

All participants agreed that product information was closely related to consumer trust. They assumed that, when a product brand was not known, the consumer would be more likely to read the ingredients list. Here, the participants differentiated between mandatory product information in form of an ingredients list on the one hand, and brands on the other. They also considered that the distinction between product information and marketing was often difficult in practice since some labels might serve both purposes, as for example, the of GM-free labels.

However, participants felt that the availability of product information had intrinsic value, even if few people used it, and had a positive impact on general consumer trust and finally purchasing decisions.

One participant called for a broader understanding of product information, taking more sources of information into account, for example sales persons, which could complement the limited information possibilities on products and packaging.

Discussing the example of nano-silver kitchenware, most participants agreed that this should be labelled, but invoked different reasons:

- One group of participants stated that, since products had to be safe before placed on the market, labelling would at least be fair and would improve consumer trust. However, labelling rules needed to be carefully evaluated since extensive labelling would not clarify the situation for consumers against the background of a number of labels already in use. Not only specific product applications needed to be considered but also the problem of how to explain the concept of “nano” in simple ways comprehensible to consumers.
- Another group of participants referred to the labels currently used in food contact materials and stated that there was no necessity to label such products containing nano-silver. This could possibly even create mass hysteria.

¹¹² ALARA: As low as reasonably achievable.

Regarding the direct application of nano-materials in food and for residues all participants were in favour of a distinct labelling rule. The reasons given, however, differed again:

- One group of participants stated that in this case more moral arguments would have to be taken into account. Freedom of choice for consumers needed to be assured.
- Another group of participants based their plea for a label for such products on a case-by-case basis. One participant did not agree that moral issues were a sufficient reason for labelling requirements. Another participant would be in favour of labelling if the exposition of consumers or the characteristics of a food product had been changed by adding a nano-component. Such changes also needed to be communicated to consumers by inclusion in the ingredients list.

8.1.4

The role of participation

Public participation was discussed at two levels: the process of product or material authorisation and regulatory decision-making.

Participants agreed that a good understanding of consumer concerns was required, but had different views on whether public participation should be integrated into authorisation processes and rule-making and to what extent participation should influence decisions. Examples of good and bad practice were discussed, as well as criteria for a successful participatory process.

All participants agreed that for legislation and rule-making, opportunities for public involvement were needed. With regard to product or substance authorisation processes, some participants questioned the role of public participation, since mostly technical questions needed to be solved.¹¹³ Some participants were concerned that public participation would open up authorisation processes to political debates; the GMO experience had shown that this could render authorisation procedures ineffective. Other participants, however, saw a role for public participation in authorisation processes as an extra tool to receive information from the public on socio-economic aspects (“other legitimate factors”) of the product or substance under consideration, which needed to be taken into account by risk managers without necessarily determining the decision about authorisation. It was argued that the reasons behind public attitudes needed careful consideration. With a view to the impact of nanotechnology on further social developments this group of participants

¹¹³ One respondent referred to the „water chicken example“: Consumers did not understand that water needs to be added to the meat of chicken, since today there is no other way to prepare chicken for the market. Consumers did not understand the science behind the process.

strongly favoured the participation of citizens in both the general rule-making and in specific product and substance authorisation process.

Participants finally discussed criteria for good participation:

- It was agreed that the quality of participation strongly depended on the **information given to consumers/citizens** before the start of the process since rounded understanding of underlying questions and implications was important to produce sound results from the consultation. Moreover, one participant stated that participatory consultation processes should be initiated proactively and before products entered the market.
- Participation processes needed to be **transparent with regard to how the result of the participation process influences the final decision**. One participant criticised that this has so far not been achieved in the area of nanotechnology.
- Finally, the **process should be open**. Participants called for a willingness to listen to each other. This prerequisite was considered problematic in the field of authorisation procedures, but should be required for political decision-making in the field of regulation.

Participants argued that where the topic refers to the whole European single market, participation should be pitched at the European level. Moreover, participation processes should be an integral part of all relevant European research programmes. Such a requirement, however, was felt to be problematic by one participant due to an inherent tension between the required openness and the uncertainty of the outcomes from participation on the one hand, and the rather rigid character of European research projects on the other.

8.2

Second workshop with stakeholders in Brussels

After finalising the focus groups with consumer, the research team conducted a second half day workshop with stakeholders in Brussels in November 2011 to discuss the findings and policy recommendations. Again, more than 50 stakeholder organisations were contacted and their representatives invited. Although ten stakeholder representatives accepted the invitation, only four attended the workshop, representing:

- European Consumer Organisation (BEUC),
- Food Drink Europe (CIAA),
- European Chemical Industry Council (CEFIC) and
- The Voice of British Farming in Europe (NFU).

Unfortunately, the response rate was lower than expected. Some stakeholders who had participated in the first workshop could not attend since their work

portfolio had shifted in the meantime. Three stakeholder representatives were interested but could not attend for various reasons. Several more invitees were not able to take part due to high workloads.

The discussions at the workshop were recorded and transcribed. A condensed protocol, based on the transcription, was sent to the participants for comments and amendments.

We now turn to the main findings from the workshop.

8.2.1

Research design

After an introduction into the project, the research design and the main findings, participants made the following general comments:

- Participants were pleased with the outcomes of the focus groups.
- The categorization of consumers (see below) was considered to be very useful.
- In comparison with quantitative data such as the Eurobarometer surveys, the outcomes are more detailed and provide more insights into consumers' reasoning.
- One participant called for a clear distinction between consumables and food products.
- Another participant asked that the study should clearly distinguish between products made in the EU and imported from other countries.
- Participants suggested that the study should be presented as transparent as possible.
- The report should clearly describe the term "technology sceptics" which was used in one of the presentations. It was felt that the term went beyond safety concerns and also neglected consumers' right to know in a broad sense, at least applies with regard to GMO.
- The participants wanted more clarification about the definition of nanomaterials used in the project. It was noted that the estimates about the market share of nanomaterials presented were based on different definitions.
- Participants remarked that perceptions in other countries than the five included in the study were often comparable. For example, Austrian sceptics towards nanotechnology were in many regards reminiscent to French sceptics.
- One participant assumed that the situation in Finland was different from the other four countries since Finnish consumers were "more avant-garde" with regard to technological products.

Participants scrutinised the background information provided to focus group participants. One workshop participant insisted that focus group participants should have received detailed information on GM labelling rules and thresholds as well as on risks and benefits. Additionally, the inputs used in the focus groups were questioned, too. It was also held that the focus groups participants should have been given more information about the context of GM products, conventional products and organic products, whereas the SEBEROC focus groups were criticised for relying on consumers' images of products. Nevertheless, participants acknowledged that the regulatory context was complicated and difficult for consumers to understand.

One participant focused on the differences between GM and GM-free and claimed that the rules on GMO traces were important and should be reflected in the final report.

Workshop participants also wanted to know whether benefits of nanotechnology were sufficiently communicated to focus groups, which was deemed very important for a sound assessment of the perception of nanomaterials in products.

One participant found the use of the BEUC website for the nanotechnology focus groups problematic and considered their information not as neutral; it was suggested that a website from the European Commission should have been used. Once the research team explained that only the design was taken from the BEUC website while the product-related information provided was from manufacturers, the participant still remained sceptical about possible bias. It was agreed that the research team should take special care when interpreting the findings.

8.2.2

Discussion of the findings from the project

Discussion of the findings from the research project focused on the following topics:

- Harmonisation and implementation of labelling regulation;
- the role of labelling;
- labelling and definitions in GMO and nanotechnology,
- product register;
- communicative challenges;
- burdens of information;
- participation: perceived gaps between consumer needs and current regulations, opportunities for NGOs and other organisations, tensions with international treaties, and national consumer views
- the role of NGOs in labelling.

We now discuss these topics in turn.

Harmonisation and implementation of labelling regulation: Participants discussed the level at which labelling rules should be implemented, national policy space, harmonisation and compatibility with international treaties. Participants stated that mandatory product information should be harmonized throughout the EU whereas member states might be given some discretion in regulating voluntary product information. One participant considered that for nanotechnology, sector specific national discretion might be feasible, but that for overarching regulations the EU had to find a compromise, in particular since “national solos” might contravene international treaties. Participants pointed out that the definition of nanotechnology needed to be harmonized since it forms the basis for all labelling requirements. It was also highlighted that the labelling system was to some degree covered by international treaties so that alterations could meet some difficulty and the degree to which stakeholder demands could be met might be limited. In particular safety instructions were regulated internationally and codified by international treaties.

Role of labelling: Participants stressed that the purpose of labelling was not safety (especially in food) but freedom of choice. Whereas some participants stressed that consumers should know about uncertainties over the impacts from products, others claimed that knowledge gaps were deliberately accepted by regulators and should therefore not be a concern to consumers. It was also argued that consumers should be in a position to choose between products with either known or more uncertain impacts, bearing in mind that this does not mean that products labelled and marketed in the EU (and therefore approved to be safe) are unsafe. One participant pointed out that focus group participants had weighed benefits against uncertainties in the case of nano-chopping boards and that it would therefore be very important to label such products to facilitate consumer awareness.

GMO definitions and labelling: One participant considered the different labelling approaches in EU member states an unnecessary burden. Moreover, she stressed that the current labelling scheme for GM products was based on the concept of identity preservation; consequently producers undertook considerable efforts to preserve the conventional or organic character of products and to comply with regulatory definitions of “GMO-free”. While this system reinstated confidence, consumers needed to know about it. It was also argued that any negative labelling (“free of”) had to operate with thresholds, including those currently in force for the GM content in organic or conventional food. In order to not mislead consumers the precise meanings had to be communicated properly. Another participant replied that the small print requirements of positive labelling schemes as in Europe might be problematic due to their low prominence; the study hence needed to take the prominence of a GM product into consideration.

Nano definitions and labelling: Participants referred to the general definition of nano-materials set at EU level briefly before the workshop. However, they

also pointed out that definitions of nano-products would be provided in sector specific regulation. In contrast, entries into the current register of nano-products were mostly based on manufacturer claims. One participant said that nano-scale substances should not be treated differently from their bulk version. Identifying the difference between “nano” and “micro” was deemed problematic. Products with an applied nano-coating were cited as an example and a plea was made for a case-by-case decision on product safety. While this implied that the manufacturer had to scrutinise the use of nano-scale substances, the participant felt that the enforcement tools in REACH were sufficient to ensure that applications are safe. However, the introduction of a different system for nano-materials in food (novel foods) would signal that those substances are indeed different and required re-authorization to ensure that recent risk assessments are available.

Product register. All participants agreed that a register implemented by the EC would be useful for the development of nanotechnology in consumer products. Most participants would support the Commission in setting up rules for such a register as well as implementing it.

Communication challenges. Participants felt that most consumers were not particularly interested in communication about regulatory schemes and systems. Some participants even pointed to possible tensions between large amounts of detailed communication and the need for more certainty on the side of consumers. One participant remarked that certainty could not originate from the industry. Another participant remarked that the problem was not the methodology of risk assessments, since such risk assessments and classifications had been in place since 1967, but the communication gap between institutions or manufacturers and society that potentially undermined trust in the system. In this respect both sides had to learn: while communicators had to better understand what to communicate and how, consumers should become more aware of the existing systems.

The suggested use of smartphone apps was deemed an interesting supplement but should not substitute established communication through labels and on-package or on-product information. Another participant mentioned that a mandatory scheme for nano-labelling on food had already been negotiated in the European Parliament. The participant reflected that on-package information had limits since labels needed to remain meaningful but that labelling also had to be honest; future developments hence had to take into account a wide range of factors.

Participants felt that nanotechnology was difficult to communicate in lay terms. One participant reported that her organisation had retreated from communicating the fact that nanomaterials also appear naturally after coming to the conclusion that such information would not be trusted, especially when it comes from the industry or retailers. Still, the participant thought that such

information was important for consumers to know and would contribute to informed choice.

Participants agreed that in deciding whether labelling was honest or misleading, two elements were essential: what is labelled and how it is communicated. Participants agreed that different organisations had different ideas about what was misleading. They highlighted that there were even different understandings about what constituted a GM product or a GM-free product, as visible during recent approaches by member states to establish GM-free labels.

Burden of information: Participants stressed that any mandatory information requirements in risk assessment or risk communication created burdens to producers and manufacturers and possibly also to other actors along the value chain. One participant remarked that REACH had accelerated information flows for both new and old substances. However, for new substances information requirements and hence regulatory burdens were higher. Another participant noted that for food products, safety and information requirements were more stringent, resulting in higher regulatory burden. Materials to be used in food first had to be approved to enter a positive list.

Participation challenges and the role of NGOs: The focus groups research had found that communication remains a challenging task and pointed to an existing gap between the regulatory information requirements and the information needs of consumers. Current participation arrangements contributed little to overcome this information gap. However, with regard to the processes for inclusion of civil society one participant claimed that an appropriate system was in place and working, providing equal opportunity for every NGO and other organisation to participate and make a contribution. It was argued that the labelling system itself was to some extent dictated by international treaties and therefore an alteration would be very difficult and the influence from participation limited. One participant remarked that the role of NGOs in the regulation of converging technologies was not to scrutinize whether the right information was communicated to the consumers, for example via mandatory labels, but that it was the role of the state to monitor and enforce compliance with the regulatory framework.

8.2.2.1

Follow-up research

Participants articulated a need for more research to acquire a better understanding of the information needs of different types of consumers. Such research should integrate further disciplines not covered by the project, for example marketing. Moreover, a special focus should also be placed on the question of enforcement.

One participant reported about a roundtable on GMOs she had organised several years ago; she could now relate the different conclusions drawn by different participants despite being exposed to the same information to the three distinct types of consumers identified by the SEBEROC project. The participant claimed that consumers needed different information from different sources to represent balanced information. The effect of differences in information exposure should be covered by a follow-up project.

Participants also suggested that the impact of different ways of information provision needed further research, linking to (social) marketing research.

Finally participants felt that more research was needed on rule implementation and enforcement.

9 Conclusions

In retrospect different questions relating to the informational behaviour of consumers in the field of new technologies products, as well as participation of stakeholder groups were raised and refined during the project by taking into account the views of the stakeholders. These were

- How do consumers perceive and assess human health and environmental impacts from new technologies?
- How do consumers respond to technology related information?
- How do consumers respond to information in different media (on package, online)?
- Are there national differences (A; D; NL, SF, UK) or differences across technologies that need to be taken into account?
- How can CSOs participate more effectively when regulating CTs?
- How do CSOs view the role of consumers?

To answer these questions two workshops with European NGOs were carried out, as well as telephone interviews with national stakeholder groups and focus groups with consumers in the five countries for both technologies – nanotechnology and biotechnology.

By bringing the findings together a differentiated picture of the views of stakeholder groups and consumers in the countries was achieved. Subsequently, the viewpoints are discussed together to conclude on the two objectives of the project – consumer information and participation.

9.1 Regulatory aims of consumer information regulation

Consumer information through information attached to a product aims to improve the protection of consumer interest by providing the information needed to make informed choices; it should not be misleading. By applying a wider definition of consumer information and also taking into account information provided to the general public through different means besides on-product labels the information should also build a basis of confidence in product information and should enhance consumer trust in the framework of product authorisations.

Stakeholders had different perceptions and concepts of “risks”, which will be further discussed in relation to benefits in the following excursus.

Excursus: Stakeholder views on market entry requirements

The principle and uncontested regulatory aim was that products on the market need to be safe. Foremost they should not endanger human health or the environment. In some cases animal health is also addressed directly (for example in the new Biocides Regulation). At the same time, some stakeholders stressed with a view to the functioning of the internal market that the regulatory requirements should not create unnecessary burdens to producers and retailers. Especially in the field of biotechnology and nanotechnology such burdens should be evaluated carefully since the development of the technologies in Europe was strongly dependent on market entry requirements as part of the European innovation policy.

Participants in the first EU stakeholder workshop ranked health, environment and occupational safety as very important. Animal health was considered important.¹¹⁴ Safety and related authorisation requirements originate from the application of the precautionary principle; where they interfere with the functioning of the internal market and innovation, this was considered as a real burden by some stakeholders. A tension between safety and related authorisation requirements and economic growth was flagged up by some participants. However, the functioning of the European market was considered to be a less, but anyway important subject for both technologies. Moreover, participants also stated that regulation should not only focus on risks but also consider benefits from novel technologies. Some stakeholders complained that GMO discussions were slanted towards risks with the effect that in Europe the potential of this technology could not be developed as in some other countries. Furthermore, the impacts on SMEs were considered important as again evidence by the GMO situation where the cost and difficulty of product authorisations overburdened most SMEs with the effect that mostly transnational companies benefitted from the technology.

In the national stakeholder interviews there was a broad perception of risks relating to both technologies. Between the different stakeholder groups there were not only different perceptions of risks but the respondents also applied different concepts of risks. Here, direct risks from the technology applied in production and products were mentioned, but also the risk that regulation of the technologies could destroy potential benefits.

While some stakeholders did not see any risk from approved GMOs on the European market, since the authorisation process ensured that any approved product was safe, a considerable number of respondents referred to residual risks arising from uncertainties about GM soy's long-term impacts, as well as ethical or moral concerns. The latter were especially raised with regard to the

¹¹⁴ There were no animal health stakeholder groups attending the workshop.

cultivation practices of transnational companies in South America, with health risks and social detriments for the rural population.

For the nano-case the health and environmental risks perceived were based upon a higher level of uncertainties as compared to GMOs. However, some respondents did not see any risks from the use of nanomaterials in products since precautionary measures were adopted and nanomaterials as such were not new materials with many nano-substances occurring naturally.

For both nano and GM, industry and commercial stakeholders also referred to the potential benefits, especially in Germany, and highlighted the burdens from overregulation. Information requirements were perceived to represent considerable burdens, especially in connection with authorisation purposes. However, for nano technology some Finnish respondents argued that such burdens could have the effect that unnecessary nanomaterials would not be placed on the market. A German dairy farmer organisation pointed to a very different kind of risk, and worried that more downward pressure on producer prices could lead farmers to use GMO feed, which in turn could attract negative publicity and affect the image of dairy farming.

By taking into account the views of the stakeholder organisations for the purpose of evaluating the current regulatory aims in the field of market entry requirements, which are applicable to both technology case studies, it is apparent that there is currently no agreement on what risks should be taken into account to deem a product safe by law. Consumer safety is a very important issue but the consideration of systemic and uncertain risks divides the stakeholder organisations. On the one hand that is due to their work for a specific clientele, but on the other hand, this is apparently due to different concepts of what is deemed to be a risk.

9.2

Viewpoints of EU stakeholders

The participants in the workshop for European stakeholders ranked the protection of consumer interests for both technology cases as very important. In the discussion about product information for consumers the aim “informed choice” with a view on “consumer interest” was highlighted.

Stakeholders were adamant that such information should not be confused with safety concerns, since safety “is a must”, i.e., a precondition for the approval of any consumer product. This was echoed by several national stakeholder interviews. Any link between safety of products and labels was contested. Some argued that any such link should not be abused to assign to consumers responsibility for safety. Labelling and consumer information should enable consumers to choose between products. For some stake-

holders, this consumer choice is essentially linked to moral choices about developmental pathways, for example with fair trade or organic farming products.

The clear separation between arrangements for consumer safety (risk assessment and management) and information (mandatory and voluntary labelling and information) dominant among regulators and professionals working on the subject was not shared by all consumers, some stakeholders assumed. There was an impression that many consumers understood labelling differently and tended to link labelling with safety issues. Discussions about the role of consumer information displayed divided views about nano-specific labelling scheme for kitchenware. One group was advocating for nano-related consumer information on basis of fairness and trust to consumers, but also referred to problems arising from a lack of knowledge about nanotechnology among the wider public. The other group saw no necessity for a nano-specific label which would only create a “mass hysteria”. For nanomaterials in food the participants were generally in favour of nano-related consumer information either as a general mode or on a case-by-case basis, but they also cited different reasons. Some referred to moral concerns which could arise amongst consumers and that a freedom of choice needs to be upheld. Others responded that moral arguments should not be a reason for product information, but if the properties of a traditional product were changed this should be communicated to consumers.

European level stakeholders presented different views about the purpose of labelling in general and its specific advantages and disadvantages in the case of nano products. These differences originate from diverging perceptions of consumer interests. However, a common view was shared that labelling of nano products would be problematic due unless linked to meaningful product information – otherwise such a label would be of little use for consumers which are not familiar with the concept of nanotechnology. Taking into account other aims of EU regulation, especially the functioning of the single market, some stakeholders were apparently concerned about the impacts of labelling on consumer attitudes towards nano products. This finding resonated with the interviews with national stakeholder organisations, which are presented in the following section.

9.3

Viewpoints of national stakeholders

Not surprisingly, the national stakeholder interviews revealed different viewpoints on consumer information in both technology cases.

Depending on the level of national public knowledge about the technology, as well as the organisational role and mission of national stakeholders, the

purpose assigned to consumer information varies. The same was true for the assessment whether information was sufficient and necessary, the appreciation of “informed choice” and ideas about the relevant aspects of consumer choice. Here, the views differed whether product information should be given on safety issues:

- Some stakeholders stated that potential safety issues arising from the product itself due to uncertainties should require the product to be labelled and current labelling practices were considered in parts not sufficient. This group assumed that in general consumers would be interested in such information, if not now then in future once they became aware of the products being on the market and of the implications of uncertainties.
- In contrast, some organisations stated that product information was not necessary since there were no risks from the products on the market. This group mostly referred to safety testing and authorisation procedures that guaranteed that any product entering the market was safe. Some stakeholders also stated that consumers were not interested in information about a product being a new technology product unless relevant product characteristics were altered.
- Some stakeholders argued that product information requirement could be based on ethical or moral issues arising from product processes, especially in the field of GMOs; they asseverated that many consumers were highly interested in such information.
- Other stakeholders stated that the use of either technology in the production process case of should not be a reason for product labelling, in particular since such a label would carry little meaning for most consumers.
- Some stakeholders doubted whether a technology related label would enhance informed choice.
- Some stakeholders stressed the relation between labelling and the functioning of the single market and were critical of product information requirements that would impose costs to producers,; they were also concerned about the possible negative connotations of a poorly understood label that would hamper the marketing of the products.

In sum, opinions among stakeholders were divergent. This was apparently due to two areas of dissent:

- the purpose of product information and
- the role of product information for consumers.

Especially the purpose of product information and any links between labels and (perceived) risks were highly contested. Moreover,

9.4

Interim conclusions on different consumer and stakeholder viewpoints

Summarizing the results so far, there are different stakeholder views on the purpose of product information and the necessity and sufficiency of product information relating to new technology products. Moreover, some stakeholders are concerned about the impact of product information on the functioning of the single market. On the contrary, some stakeholders also assumed that labelling might reduce unnecessary ingredients especially in nano products.

By taking into account the results of the focus groups these ambivalent views on product information purpose and effect do not surprise since there are actually different consumer types which are likely to correspond to the perceptions articulated by the stakeholder groups.

9.5

Consumer viewpoints

As observed in all focus groups the participants tried to understand and assess the new technologies products by taking recourse to their own experiences and knowledge and by trying to transfer them to the new technologies products presented. Consumers often essentially thought about metaphors like “super-weed” or “feeding the world” and tried to compare the technologies behind the product with things they know (“Is this like asbestos?”). The experiences and knowledge expressed during the focus groups showed some cross-country differences which are rooted in different discursive, institutional and technological trajectories and traditions (as presented above in the country case studies).

Although consumers in Europe are a heterogeneous group, with regard to informational behaviour and information needs three different consumer types relating to three different consumer groups could be distinguished. These three groups display distinctive attitudes with regard to trust in information and risk assessment processes, different levels of ambition to seek information, and take a different stance towards new technologies products and the use of various product information sources. All three types of consumers could be found in all five countries. However, due to the exploratory nature of our research, we have no data about their relative frequency.

In a first step the consumer types are described (see chapter 9.6). In a second step their informational needs which are directly related to informed choice and trust are discussed (chapter 9.7).

9.6

A typology of European consumers – towards a differentiated model of consumer behaviour

Focus group participants in all countries often felt overwhelmed and surprised by technological developments (see above section 7.5 on the overall findings across both technologies). Some, however, were more confident in dealing with new technology products than others. A closer examination of the focus groups allowed us to distinguish three different types of consumers which could be identified in all countries. The three types differ significantly in their responses to technology related information and in the type of trust they displayed towards products, producers, information and regulatory framework.

In order to highlight the different trust attitudes, we have called the three consumer types

- the fatalist consumer,
- the informed consumer and
- the citizen-consumer.

9.6.1

Fatalist consumer

Fatalist consumers rely display an attitude of pervasive distrust. They suspect that producers and retailers generally try to cheat on consumers and would not tell the truth about their products unless forced to do so. When confronted with product information, fatalist consumers tend to ignore or discard it; their behaviour is rationalised by their lack of trust. Fatalist consumers will generally doubt the trustworthiness and independence of any source of information. They will often present anecdotal or historical evidence to confirm their pessimistic outlook.

But fatalist consumers still purchase and consume products. At the surface in a rather reluctant way, they completely rely on the state-backed regulatory framework to ensure that products on the markets are safe. Paradoxically, fatalist consumers will often also be suspicious of the state and will cite media coverage of some consumer scam or agency scandal. Although fatalist consumers also tend to distrust politicians, they behave as if they had great faith in the institutional framework; they effectively count on the dependability of the health and safety institutions in a quite uncritical manner since they undertake little effort to actively use or cross-check available information. Fatalist consumers will be happy with reliable health and safety regulations that effectively protect consumers and the public; they are less interested in product in-

formation and labels since they do not believe in claims which cannot be proved on the spot. Their information uptake is rather passive, for example through general interest news. Neither are fatalist consumers particularly interested in product qualities which they cannot sensually experience, such as particular production processes. They would therefore attribute little value to nano- or GM-labels.

Fatalist consumers tend to be statist; they place the main responsibility for product and environmental safety, but also for true consumer information with the state. They see little responsibility with the consumer, whom they perceive as rather powerless and passive.

In sum, fatalist consumers show a paradoxical distrust-trust relation with regard to products on the market and available information. In general they do not feel that their purchasing behaviour or demands for better products or product information would have any impact. They are convinced that producers would put all sorts of ingredients into products anyway, but in general they still do not expect to experience harm from the consumption of products on the market.

9.6.2

Informed consumer

Informed consumers actively search for information but their interest is mostly limited to the personal costs and benefits of their purchasing decision. Informed consumers often extensively seek for product-related information, cross-checking various sources, looking for product reviews from consumers and independent sources and cross-checking the reliability of product information. However, they demonstrate little interest in information that is not directly related to the functionality of the product, such as wider environmental or social impacts or data from regulatory approval procedures. The terms of reference for informed consumers are mainly their everyday lives. Informed consumers can be more demanding than the other two types with regard to closely product-related information, but they will show little interest in the availability of background information that is so relevant to the “citizen consumer”. Although they feel involved to exercise their consumer power, informed consumers tend to attribute responsibility for product implications to the state and the producers; they will normally assume that basic health and safety standards are guaranteed. But since they will always look for more information to get a better deal, they will normally come across information about serious shortcomings and will avoid inferior products (unless they are very cheap). . Informed consumer will typically use the information on offer, for example on-package product information, but will seek more information

only if they product is relevant. Rarely will they look for the background of a technology related to a product if they are satisfied with the information about the use value of the product. Being active users of available information, informed consumers require well explained labels which will influence their purchasing decisions. In contrast to citizen consumers, informed consumers will buy organic products not in order to opt for a specific mode of production, but occasionally if they perceive a personal benefit and if other purchasing criteria such as the prices are also sufficiently satisfied.

In sum, informed consumers are active and often critical users of available information, but their interest is focussed on personal benefits and costs. In general they are aware that products on the market are tested and rely on the safety of approved products, but they also want to have the possibility to critically assess the product quality according to their personal purchasing criteria.

9.6.3

Citizen-consumer

Citizen-consumers are self-confident in interpreting the meaning of product and technology-related information. They are interested in background information and how institutions work. They happily take up available information and might cross-check using various information sources, depending on the relevance of the product to them. Citizen-consumers appreciate the possibility to communicate directly with producers or other sources of information, even if they do not actually use this opportunity. Citizen-consumers expect much information to be available in the public realm and take a critical stance towards information on offer, without being generally suspicious; rather, they actively assess the trustworthiness of a source of information and rely on information from trusted sources. Members of this group are interested in wider technology implications, making them citizen-consumers rather than just informed consumers. They display some interest in the social and ecological impact of their purchasing decisions. Citizen-consumers can link consumption to wider societal developments and tend to feel responsible for avoiding environmental or social harm when making purchasing decisions. In general, they are aware of the “power of consumers” and sometimes try to shape markets and developments through their product choices. A good example for such kind of consumer type is the “organic consumer” who takes information related to production process into account when making purchasing decisions, but who also critically scrutinises the various organic product information on offer on the European market. While citizen-consumers attribute responsibility to producers and the state for proper product information and risk assessment, in specific circumstances, they selectively become active,

for example by writing letters or online reviews or by addressing their protest directly to those actors; and of course selecting other products they deem to be more appropriate.

To summarize with regard to trust in information, citizen-consumers carefully assess the trustworthiness of various sources of information; they rely on trusted sources when making purchasing decisions. They appreciate the availability of a broad range of information about products and production processes, even if they do not use it, and see the availability of such information as a precondition for general trust. Mandatory information and state-backed scrutiny of available information are highly valued. Transparency and the possibility to cross-check information if wanted are the cornerstones of the citizen-consumer's trust in products and the marketplace.

9.7

Informational and regulatory needs of the different consumer types

The three consumer types have very different information and regulatory expectations, and it requires a range of different tools to make them happy. The following diagram arranges the different elements of consumer protection and information policy as layers of a pyramid which successively build upon each other (see Figure 22: Information/regulation pyramid based on information).

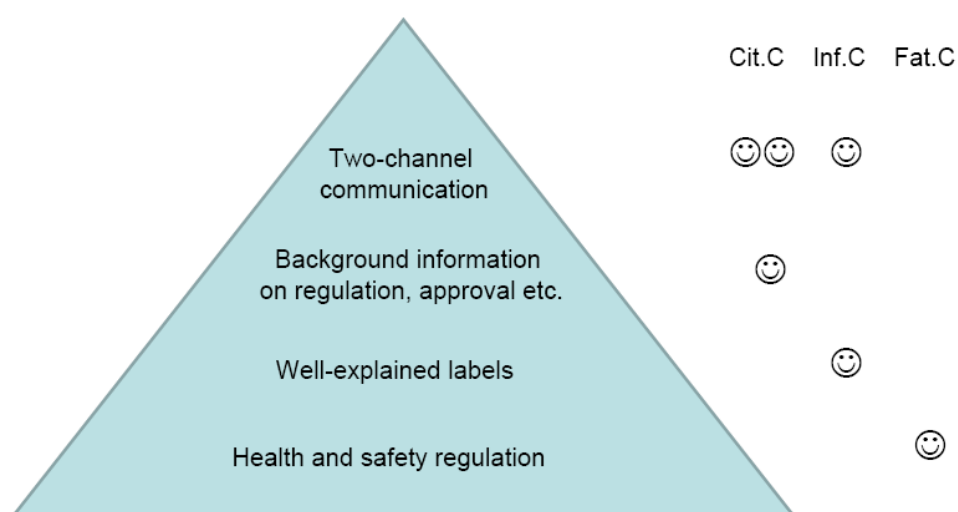


Figure 22: Information/regulation pyramid based on information

In the following the information layers are discussed.

9.7.1

Health and safety regulation

The base layer of the pyramid is health and safety regulations. These are important for all three types of consumers. But the smiley on the right hand side indicates that, if effective, they are sufficient to satisfy fatalist consumers. They would not expect much additional information and would rely on the assumption that any product on the market will be tested and approved by the relevant authorities.

The focus groups, however, revealed that many consumers have a more complicated view:

- Although producers were often perceived to be responsible for consumer safety, the focus groups in some countries also insisted that the state should play a role in setting up safety requirements and controlling these safety requirements.
- With a view on the responsibility of further actors such as consumer NGOs, some participants stated that they should at least contribute to risk assessment discussions. The participation requirements raised by consumers and stakeholders are further discussed in section 9.8 .

In any case, informed and citizen-consumers would not be happy with health and safety regulations alone. For both groups, being able to choose between a product with or without nano or GMO technology is important. Both groups hence also demand a reliable system relating to product information.

9.7.2

Well-explained labels

The next layer of the pyramid is reliable labels and on-product information such as ingredients lists. In the project examples this would include information on the presence of GM soy or nano-silver in the product, for example the “contains genetically modified soy” or “contains nano-silver” information or a “GM free label” or “nano product label”. Such information builds upon the first layer since labels or product information in general should not substitute risk assessment and management.

Informed consumers and citizen-consumers will value such information and might be influenced in their purchasing decisions. Both groups expect to be informed about the use of novel technologies or the presence of novel substances or ingredients. Both types of consumers consider labels as valuable if they are well-explained since they allow consumers to avoid products they dislike or about which they are uncertain. The participants in the focus groups stated that labels raise awareness and trigger further questions, but in general

informed consumers do not question the labelling requirements if the labels are well-explained. To take up the information attached to a product the following requirements were stated:

- A label or product information must be advertised to have value for consumers. The focus groups participants stated that there is a need for introductory campaigns.
- A verification structure behind the labels or product information is required to promote trust in the system.
- Especially for labels like “GM free” or “nano product” there should be a registration requirement. Additionally, a state-backed labelling scheme has a considerable value for consumers. With a view on the “GM free label” in Austria, the labels were state backed and officially introduced. Here, the label was well-known and widely trusted by participants.

Information about the certification organisation of a label helps to promote trust, since it indicates some sorts of control. Additionally, a link to further information sources on the product is useful to informed and citizen-consumers. Even if they do not actually check back about the requirements for the label, both types of consumers value the availability of institutional information which also helps to counteract suspicion and promotes trust in the product information and product safety requirements.

Since the possibilities to explain such implications on a product are limited, the link to more information is crucial for both citizen and informed consumers. Taking into account both consumer types’ requirements the information should at least consist of

- the label/product information stating the ingredient or presence of a technology itself,
- the effect of the ingredient (especially in the case of nano),¹¹⁵
- the assigning organisation for the label such as “GM free” or “nano product”,
- a link to further information about the product, for example in the internet.

During the focus groups, many participants located responsibility for product information to producers, whereas the state was expected to control that product information is correct and appropriate.

¹¹⁵ The participants of the consumer groups were very unfamiliar about nanotechnology and nano-silver. They questioned the benefits to them and wanted to know why such an ingredient is used.

9.7.3

Background information

Citizen consumers will often not be satisfied with health and safety regulation and well-defined labels alone. They will often want to be able to check the information, understand the institutional background and look at information produced during the approval process. Even if citizen consumers will rarely use such information, they appreciate its availability as a means to build trust in the system and to better understand novel products and technologies.

Such background information should include:

- In-depth information about the specific ingredients used in a product, their effect and implications with regard to benefits and risks of the product itself and benefits and risks arising from the production process.
- Further explanation of specific product information with regard to mandatory or voluntary labelling requirements, assigning organisation and controls.
- Information about the technology and its use in consumer products or production processes in general, as well as risk assessment processes.
- Information about product information rules concerning on-package information of the new technology in general

Since information needs are very broad, it was deemed useful to have a resource on the internet. Moreover, parts of information needs might be served at the point of sale by for example information brochures or sales persons. In addition, some focus groups demanded balanced information on the risks and benefits of a product or a technology.¹¹⁶

9.7.4

Two-channel communication

The top of the pyramid consists of forms of two-way communication where consumers can interact with producers, retailers or agencies. The three layers so far only contain one-way communication. The opportunity for two-way communication would be of little interest to fatalist consumers. Informed and citizen-consumers, however, would highly value such instruments. For informed consumers, it provides an opportunity to ask questions and receive information tailor-made to their interests. Consumer concerns and more in-depth explanations of unclear issues could be addressed.

¹¹⁶ The balanced debate requirement may also be part of participation procedures, discussed in section 9.8.

In contrast, citizen-consumers would seek to develop two-way communication into public fora for reflection on the benefits, limits and implications of novel technologies and products. Citizen-consumer would want to use the opportunity to hear more about the underlying visions of producers and product designers, their ideas about responsibility and the role of consumption. Such fora could contribute to a more reflexive governance of novel technologies by fostering understanding of the values and life style choices which are implicitly promoted by products and technologies.

The move from one-way to two-way communication marks the step from consumer information to conversation between consumers, producers and other relevant actors, including

- authorities,
- assigning organisations,
- producers,
- retailers,
- NGOs and other stakeholder groups, and
- other consumers.

In many cases electronic communication platforms are useful, but also sales persons should play a role, since they are directly available at the point of sale. Moreover, different modes of communication are available on the internet (fora, blogs, comment sections etc.). The wide range of social media will probably revolutionise communication with informed and citizen-consumers, offering active consumer new ways to articulate and share their interests and concerns.

9.8 Participation

First, a short distinction between two modes of participation procedures in the EU should be made. One mode is aiming at the participation of the general public for the purpose of policy making with influence on legislation. The other mode is subject to governmental duties in the practice of regulatory embedded tasks, for example in the authorisation of nano-related substances or GMOs to gain access on the European single market. With a view on the aims referring to administrative tasks the purpose is to improve trustworthiness through transparency of the decision-making process. In this section, we reflect on how the outcomes of the participation carried out in the research project could have influenced participation on the administrative level.

In a review of the findings and the experience the research consortium gained in applying the participation method two different findings are highlighted.

First, the views of the participants of the focus groups and the views of the participants of the interviews with national stakeholders are summarized. For each actor group independent conclusions are made in chapter 9.8.1 and 9.8.2.

Second, the method of participation applied in the research project is critically evaluated. The research project experiences are reflected in chapter 9.8.3.

9.8.1

Consumer participation

Notably, public participation was considered to be less important by most of the European stakeholders in the first workshop than other regulatory aims. However, it should be kept in mind that public participation was discussed in the context of direct consumer/citizen participation. On the one hand, since the authorisation of products is aimed at resolving technical questions, the participation of laypersons needs to be carried out carefully. Some stakeholders were concerned that the product authorisation process would become dominated by political questions as has been the case with GMO-authorisation in the EU. Some stakeholders criticised that participation of the general public could render the authorisation process ineffective. However, to get a better understanding of consumer concerns such public participation processes could have their merits. Two minimum requirements were stated: proper information to the public which directly influences the input to such participation procedures, and transparency with regard to the actual influence of the input to the final decision. By referring to public participation in policy making the participants of the Brussels workshop also advocated for an open debate in which the parties listen to each other. In any case, stakeholders were sceptical about the idea that direct consumer/citizen participation could directly influence the decision on product authorisation.

Participation was also promoted by some participants in the focus groups. Although direct participation especially in the field of the new technologies authorisation processes was deemed to be a very complicated task for most of the consumers, they also expressed a desire to be listened to. Moreover, they criticised a lack of balanced debates in the field of GMOs, which makes it difficult for them to make up their mind about the new technologies and their impact.

Taking the knowledge of consumers in relation to risk assessment into account, focus group participants expressed the feeling that they were not able to contribute directly to the safety assessment process. Instead, they delegated responsibility to state agencies or consumer NGOs.

Nevertheless, a desire to be listened to was repeatedly expressed and is also reflected in the pyramid of Figure 22. Here, however, the two-channel com-

munication builds upon, inter alia, a sound risk assessment as part of health and safety regulations. While especially citizen consumers require more opportunities to directly exchange views on a product or technology, they will still mostly rely on experts to assess the health and safety of a product or substance to be placed on the market.

In sum, participation requirements to bring in consumer views include:

- participation should promote a balanced debate, by
- taking up and equally presenting the different views of stakeholder organisations.
- Direct participation of consumers in the authorisation process is not necessary, but
- at least a possibility to express their concerns needs to be implemented.

Considering that consumer views are strongly related to the national context, the participation of national stakeholders is now discussed.

9.8.2

Participation of national stakeholders

In the interviews with national stakeholder organisations, the opportunities were discussed to engage directly on the European level, as well as indirectly via European umbrella organisations.

The answers about possibilities to be represented at the EU level by EU stakeholders and to participate in EU procedures are more or less the same for nanomaterials as for GMOs. Interviewees were in general content with the possibilities, although some saw difficulties arising from different agendas of national and European organisations. Therefore, some respondents took care of lobbying themselves and they reported positive experiences.

However, some NGOs expressed concerns and stated that participation at EU level required resources and relational know-how. Moreover, to participate at EU level would mean that they had to dedicate specific resources to the task while facing limited budgets.

9.8.3

The SEBEROC experience

During the research project specific experiences were made with regard to participation of consumers/citizens and representatives of stakeholders. Those experiences are now critically reflected to support the insights acquired during the project and to inform future participation processes.

9.8.3.1

Participation process

The experimental participation process of the research project applied a specific approach consisting of four steps:

1. Interviews with NGO representatives on national level
2. Workshop with representatives of NGOs on EU level
3. Focus groups with consumers/citizens on national level
4. Concluding workshop with NGO representatives on EU level

The single instruments were thought to form single steps in an overarching participation procedure. Each step's finding formed the basis for the subsequent step.

As experienced in the research project the efforts to apply the single instruments are reasonably manageable, but also complications arose taking into account national differences. Since technology developments are different across on a national level bringing up different policy questions to be solved at a single point in time, the national stakeholders' agendas were differing to a certain extent, which led to difficulties in acquiring stakeholder views on a topic which was out of a scope of some stakeholder organisations. The situation was aggravated by the stakeholder organisations' different resources which needed to be assigned to their core topics. Those core topics were set in their yearly working programmes.

Since the research project took two years and two workshops with EU stakeholders were envisaged at the beginning and at the end of the project, difficulties arose because the working agenda of stakeholder organisation had considerably changed in the meantime.

To overcome those difficulties their participation needs to be put on a more official level, which could be done by assigning funding to their contribution to the research project.

9.8.3.2

Discussions about consumer/citizens views

The specific advantage of the applied research design is that discussions among stakeholder representatives arose directly on the findings from the focus groups with consumers/citizens. In the first workshop with EU stakeholders different beliefs and experiences were expressed with a view to consumer/citizens' attitudes and behaviour. After subjecting those aspects in the focus groups with consumers/citizens more specific views of the citizens/consumers on the topics were brought up in the final workshop with

stakeholder organisations. Discussions on the basis of stakeholder assumptions about consumer views were subject to the first workshop with EU stakeholders and turned out to be led by specific and often different beliefs and experiences of the representatives. Here, the respondents argued and disagreed on some of the differing views. By taking into account differences in the understanding of consumer/citizens' behaviours and attitudes, the research consortium carried out the focus groups to get more insights about those behaviours and attitudes. Bringing those findings up into the final workshop the research consortium helped to build a common basis for discussions which was more accepted by the respondents. Subsequently the arguments were more focussed on the way how legislation could technically achieve the regulatory goals.

Basing discussion on consumer views nevertheless has specific limits which are defined by the specific topics which might be discussed with consumers/citizens. The frame of topics in focus groups with consumers/citizens is limited by the knowledge of the participants. In contrast to the questions arising during risk assessment based on single substances of a product, consumers/citizens have to be confronted with products and normally care less about single substances.

However, with a view on administrative duties in risk assessment, specific technical questions need to be answered which require technical expertise.

9.8.3.3

Example: Applying the SEBEROC experience to REACH

Keeping the experiences summarized so far in mind and applying them to one specific example – participation processes in REACH – the advantages of the participation process carried out in the research process could be gained for the purpose of two distinct elements in the REACH processes – exposition scenarios and socio-economic analysis. Both elements form part of the authorisation and the restriction process and third party participation is foreseen.

Exposition scenarios and socio-economic impacts of a single chemical substance are based on its use and since substances are also in use for consumer products their usage is strongly dependent on consumer purchasing behaviour as well as their behaviour when applying and disposing the product.

Still a direct participation of consumers/citizens would face specific problems. The need of information in the administrative process is of mere technical nature based on substance information, whereas consumers/citizens normally think about products not substances. Moreover, direct participation is not required by most consumers/citizens. Anyway, they expressed the need to be heard in a certain form. This leads to the assumption that the gap needs to be closed on another level.

Specific guidance documents form the agreed basis on how to interpret the Regulation and with a view on exposition scenarios and socio-economic analysis the implementation of consumer/citizen behaviour and attitudes is already subject to those guidance documents.

Guidance documents are set up by specific partner expert groups. First, the application of the SEBEROC method of participation in general could be useful to directly implement consumers/citizens attitudes and insights about their behaviour into the process of setting a guidance document, if the subject at hand has a relation to consumer/citizen attitude or behaviour. Especially, when the issues are controversial, the ability to establish an empirical basis might lead to more consensual outcomes. Besides, the advantages of participation processes would also be available to the outcomes of the expert groups: transparency and acceptability of the decision, not only from an internal, but also from an external viewpoint.

The possibilities to implement the SEBEROC method of participation are now discussed without going into the details of the single elements of the REACH processes.

“An exposure scenario is a set of information describing the conditions under which the risks associated with the identified uses of a substance can be controlled.” (ECHA 2008b, 9)

With regard to the setting of exposition scenarios guidance documents refer to approved empirical methods. The implementation of a participation process with consumers/citizens in REACH decision-making processes at this stage might prolong the decision and could result in a considerable delay. But still, it might be worth to implement a sort of evaluation process to those instruments, if the basis of negotiation is controversial.

“In a socio-economic analysis one needs to analyse and document whether the socio-economic benefits of continued use of the substance outweigh the risks of continued use for human health and the environment.” (ECHA 2011b, 1)

As mentioned above socio-economic benefits need to be assessed in some processes under REACH. As mentioned in the first workshop with EU stakeholders the question what the benefits are and if those benefits outweigh the risks of a single substance for human health and the environment cannot be answered without taking into account the views of citizens/consumers which use a product in question. Still, not every substance will be available in consumer products and also very technical questions need to be answered, as well. That means that a direct participation of consumers/citizens will not be suitable per se. However, the questions of benefits and if they are outweighing risks will in some cases likely be discussed controversially and the setting

of a commonly agreed empirical basis through the method carried out in this research project might facilitate the decision.

10

Critical remarks and further research questions

The SEBEROC study learned from different countries practices and different disciplines and acquired findings concerning the different perception of stakeholders and consumers in the considered countries on risk and safety of new technologies products, as well as on the role of consumer information and the perception of single consumer information means. The research approach aimed at a testing of a novel method, which integrated findings from stakeholder workshop into focus groups series in Austria, Germany, Finland, the Netherlands and the United Kingdom.

In general the work-steps relating to acquiring insights about the stakeholder organisation views could not be fully realised, since the interest to participate in the national telephone interviews, as well as, the workshops was rather low. Also the interest of consumers to participate in the focus groups was limited. For the empirical part this situation required the SEBEROC consortium to apply unexpected, additional efforts. This has an impact on the robustness of the study findings with regard to the regulatory impact assessment. However, the study aimed at a testing of a method and, therefore, the findings incorporate these difficulties aroused in engaging stakeholders in Europe.

Unfortunately, the participants who attended the second workshop were not the same persons as in the first workshop. On the one hand that was due to the changing of the internal work focus of specific stakeholder organisations. On the other hand some stakeholder groups were working together to cope with the workload, against the background of limited resources and priority settings. Here, it showed that the two workshops were not completely representative with regard to the views of stakeholders on European level.

Since the findings are based on the collection of data at a single point in time, it is likely that the results will last only until the situations change. For example, debates, as well as, consumer perceptions and the means to inform them are quickly developing in nowadays. Moreover, stakeholder participation is fostered throughout the European Union and research on the instruments best suitable for different purposes is developing as well which might alter the perceived responsibilities during the health and safety regulation phase by consumers.

Since a qualitative research approach was chosen to acquire deeper insights about consumers' perception of product information and related safety regulation, further research should be carried out with regard to the amount of the different consumer types in the single national populations.

By playing back the results of the focus groups in the second stakeholder workshop, the participants stated that more research needs to be carried out,

touching the specific way of informing the consumers about the products based on, for example marketing research.

11

Policy recommendations

As perceived in the focus groups with consumers many participants were uncertain about the regulatory situation relating to consumer product information. Since this was to be expected for the nanotechnology case it is an interesting and somewhat surprising finding for the GMO case, especially in the Netherlands, where GMO products are on the market.

With regard to the necessity of technology-related product information most consumers stated that there is at least a "right to know". With the amount of responsibility they address to themselves as purchaser of new technologies' products the strength of this demand varies between consumers who want to have at least a certain ability to know (passive consumers) and those which articulated a special need to know (active consumers, seeking to shape developments), since they attributed a certain responsibility to themselves which they want to fulfil in their purchasing decisions. Responsibilities

The latter consumers, which are identified as citizen consumers in this study, want to become related to technological development even or in particular when the effects of the technology are uncertain. Those consumers are sensitively seeking control over their life as a duty stemming out of the fact that they see themselves as an active citizen in society in addition to the liabilities they attribute to manufacturers and the role of the state as the guard of the safety framework.

11.1

Technology-related consumer information

1. To address the specific information needs of consumers of food-related nano or GM products, **technology-related consumer information is required**. Especially, citizen consumers and informed consumers want information.
2. The **impact of the technology-related information** on the purchasing decision **depends on the message and the image of the technology and concept of information**: GM free was connoted positively, nano ambivalent and GM predominantly negative.
3. However, **other product related parameters are in general also influencing** the purchasing decision especially prices, functionalities, brands and the design of the product and packaging.
4. With regard to different product groups the consumer product information might be perceived more or less coherent, since the **context of information needs to be regarded as well**.

5. Therefore, the **design of the product information** used triggers also different response of consumers (e.g. green vs. red labels or small vs. large print), as well as the location on the product (e.g. top, side or bottom of the product).
6. The awareness raising effect of and trust in on-package product information is also dependent on the design of labels as well as, flanking information means, for example, introductory campaigns. The **implication of content and design of technology-related product information should be analysed further**, for example by taking into account marketing research.
7. Since the meaning of GM is more established than the meaning of “nano”, the “GM-free label” had more value for participants than the “nano-product” label. Bearing in mind that “nano” covers a wide range of substances with different characteristics and application in products it is recommended to **apply more differentiated product information** analogue to the “contains genetically modified...”-information, for example “contains nano-silver”.
8. However, the **possibilities of a nano label should be explored further**, since a logo has a stronger awareness raising effect, but also might be meaningless for purchasers not familiar with nanotechnology.
9. Reliability and trustworthiness of the information is also dependent on the background of the product information practice. To deem product information reliable most consumers demand at least that the **assigning organisation should be mentioned on the product**.
10. It is recommended to implement an **official register and/or state backed national or EU labelling scheme** which assigns responsibility for labelling to the manufacturers. Here, **national differences should also be taken into account** (e.g. in consumers in Austria were in favour of a state-centred system of controls whereas consumers in the United Kingdom were satisfied with a market-centred system of self-responsibility).
11. With regard to harmonisation of the product information schemes in the EU it is recommended to **introduce mandatory labelling schemes on EU level**, against the background of the requirements of the single market and a potential misleading of consumers travelling between the member states.
12. Keeping this in mind, **national leeway should only be upheld for voluntary labelling schemes**. However, the implications of the scope of the different labelling schemes should be acquired by further research.
13. As mentioned above certain responsibilities of consumers are accepted at least amongst citizen consumers and informed consumers. Therefore the **overall informational framework conditions relating to consumer education via further information available should be taken into account**. Espe-

cially transaction costs of consumers seeking for more information need to be regarded.

11.2

Accompanying information

1. In general it is recommended to **advertise labels proactively** during their introduction.
2. Although the impacts of campaigns and further information sources are need to be assessed carefully by taking into account the knowledge and current attitudes of consumers on national level, especially **further information sources are considered to be a useful** information pool for highly motivated individuals and activists – identified as citizen consumers in this study.
3. A **link to further information sources presented on a product** is recommended, for example to information on the internet.
4. However, **further research** about the content and presentation of information via alternative sources is **necessary**.
5. The **meaning of label needs to be clarified**. Since the use of labels on a product may trigger more attention paid to the implications of the technology it is recommended to present to consumers further information about the label as is and background information.
6. To be useful for consumers in general, **background information about the technology should also cover product-related information**, since consumers are first coming into contact with products.
7. Moreover, the content and presentation of **information should not be too technical, but held in a comprehensive language**.
8. Since uncertainties relating to the safety of nanomaterials in products are relatively high and able to lower trust in safety of products, the background information should **transparently reflect the different views of the actors negotiating in authorisation procedures or on the policy level**. Additionally, with regard to nanotechnology a public debate is hardly perceivable throughout the considered countries.
9. Moreover, efforts to introduce a public debate on the national level were made at different points in time. Therefore, consumer knowledge about nanomaterials in products and about its implications are varying very much in Europe. Keeping this situation in mind, the **information available to consumers should be balanced by stating benefits and risks**.
10. The value of further information sources besides on-package information is limited, with regard to the everyday products subject to the study. Especially, **website information has little value for consumers in purchasing situations** since such information in general does not fit with routines of

consumers, is not available in purchasing situations and therefore has little impact on purchasing decisions, and bears high transaction costs.

11. However, web resources **have the advantage to publish up to date information**, which might especially be useful to communicate the recent knowledge about new technologies.
12. The use of mobile devices, for example via smartphone apps, might reduce transaction costs, but should also be assessed carefully, since smartphones are not broadly used for informational purpose at the point of sale. **Sources available through mobile devices should therefore be regarded as an additional mean of further information** about products or the technology.

LITERATURE

- ACHS (2009), Advisory Committee on Hazardous Substances, Report on Nanosilver. Department Food and Rural Affairs
<http://archive.defra.gov.uk/environment/quality/chemicals/achs/documents/achs-report-nanosilver.pdf>.
- ACNFP na., The Advisory Committee on Novel Foods and Processes, ACNFP [Online].
<http://acnfp.food.gov.uk/>. Accessed: 04/10/2011.
- Allianz (2007), Small sizes that matter. Munich: Allianz AG.
http://www.allianz.com/migration/images/pdf/saobj_796424_allianz_study_nanotechnology_engl.pdf. Accessed on: 29/09/2011.
- Allio (2011), Allio, Lorenzo, On the Smartness of Smart Regulation – A Brief Comment on the Future Reform Agenda, EJRR 1/2011.
- AMfH (2010), Nanosilber in Kosmetika, Hygieneartikel und Lebensmittelkontakt-materialien. Bundesministerium für Gesundheit (Ed.). ISBN 978-3-902611-31-1
- Andersone Gaile-Sarkane (2009), Andersone, Ieva/Gaile-Sarkane, Elina, Behavioral Differences in Consumer Purchasing Behavior Between Online and Traditional Shopping: Case of Latvia. In: Economics and Management, vol. 14, pp. 345-352.
- ANEC/BEUC (2010), Inventory of Consumer Products Containing Nanomaterials 2010, under
<http://docshare.beuc.org/Common/GetFile.asp?ID=30511&mfd=off&LogonName=Guesten> (retrieved 28 February 2011).
- ASLEF (2006), Anti-flu disinfectant for London transport? [Online].
http://www.aslef.org.uk/information/100012/100039/102484/anti_flu_disinfectant_for_london_transport/. Accessed: 04/10/2011.
- Ayres Braithwaite (1992), Ayres, Ian/Braithwaite, John, Responsive Regulation: Transcending the Deregulation Debate. New York: Oxford University Press.
- Baldwin Black (2008), Baldwin, Robert/Black, Julia, Really Responsive Regulation. In: The Modern Law Review, vol. 71, no. 1, pp. 59-94.
- Barfield (2010), Barfield, T., Get ready for a world of nanotechnology. The Guardian. Comment is Free.
- BASF (2009), Code of Conduct Nanotechnology, under
http://www.basf.com/group/corporate/en/function/conversions:/publish/content/sustainability/dialogue/in-dialogue-with-politics/nanotechnology/images/BASF_Code_of_Conduct_Nanotechnology.pdf (retrieved 28 February 2011).
- Bauer Koester Lach (2010), Bauer, M. C.; Koester, A.; Lach, S., Nanotechnologie – Regulatorische und haftungsrechtliche Herausforderungen, StoffR 1/2010.
- Bayer (2007), Bayer, O., Nanomaterials: Undersized, Unregulated and Already Here. Oxford: Corporation Watch.
<http://www.google.co.uk/url?sa=t&source=web&cd=1&ved=0CB4QFjAA&url=http%3A%2F%2Fwww.corporatewatch.org%2Fdownload.php%3Fid%3D60&ei=xh2PTry8Ho6T0QXBmIUh&usq=AFQjCNF10t494AbyXdcYYnxJqOGXbG45Qw&sig2=xleQHammLR7mbEqq1ds7Hg>.
- BBC (1999), UK: Fast-food outlets turn against GM food [Online].
<http://news.bbc.co.uk/1/hi/uk/292829.stm>. Accessed: 01/11/2011.

- BBC (2000), Farmers 'unaware' of GM crop trials [Online].
<http://news.bbc.co.uk/1/hi/uk/798969.stm>. Accessed: 20/11/2011.
- Berger (2007), Berger, M., Implementing successful voluntary nanotechnology environmental programs appears to be a challenge [Online].
<http://www.nanowerk.com/spotlight/spotid=3476.php>.
- BfR (2009), BfR rät von Nanosilber in Lebensmitteln und Produkten des täglichen Bedarfs ab, Stellungnahme Nr. 024/2010 des Bundesinstituts für Risikobewertung vom 28. Dezember 2009, unter
http://www.bfr.bund.de/cm/216/bfr_raet_von_nanosilber_in_lebensmitteln_und_produkten_des_taeaglichen_bedarfs_ab.pdf (retrieved 28 February 2011).
- BfR (2010), Wahrnehmung der Nanotechnologie in internetgestützten Diskussionen, Bundesinstitut für Risikobewertung 4/2010, unter
http://www.bfr.bund.de/cm/238/wahrnehmung_der_nanotechnologie_in_internetgestuetzten_diskussionen.pdf (retrieved 28 February 2011).
- Bizer Gubaydullina (2007), Bizer, Kilian/Gubaydullina, Zulia, Das Verhaltensmodell der interdisziplinären Institutionenanalyse in der Gesetzesfolgenabschätzung. In: Führ, Martin/Bizer, Kilian/ Feindt, Peter H. (Hrsg.), Menschenbilder und Verhaltensmodelle in der wissenschaftlichen Politikberatung. Baden-Baden, Interdisziplinäre Studien zu Recht und Staat, Nomos-Verlag.
- Bloom (2008), Bloom, J., Tiny particles hit the big time. The Guardian.
- BMBF (2010), Bundesministerium für Bildung und Forschung, Aktionsplan Nanotechnologie 2015, 2010, unter http://www.bmbf.de/pub/aktionsplan_nanotechnologie.pdf (retrieved 28 February 2011)
- BMLFUW (2009), Austrian Nanotechnology Action Plan. Jakl, T., Hanslik, S., Mühlegger, S., Pogany, A., Pürgy, R., Sušnik, M, Zilberszac, A.(Ed.). Federal Ministry of Agriculture, Forestry, Environment and Water.
- BMU (2007), Bundesministeriums für Umwelt, Nanotechnologie: Gesundheits- und Umweltrisiken von Nanomaterialien, Bundesministeriums für Umwelt, Naturschutz und Reaktorsicherheit, December 2007, unter
http://www.bmu.de/files/pdfs/allgemein/application/pdf/nano_forschungsstrategie.pdf (retrieved 28 February 2011).
- BMU (2008), Bundesministeriums für Umwelt, 1 Jahr NanoKommission – Zwischenbilanz im Dialog, Ergebnisdokumentation der Zwischenbilanz am 20. Februar 2008 im DBB-Forum in Berlin, 2008, Naturschutz und Reaktorsicherheit, unter
http://www.bmu.de/files/pdfs/allgemein/application/pdf/nanokomm_ergebnisdokumentation.pdf (retrieved 28 February 2011).
- Boggan (2008), Boggan, S., Once bitten ... The Guardian.
- Bowman Hodge (2006), Bowman, D. M. and Hodge, G. A., Nanotechnology: Mapping the wild regulatory frontier. *Futures* 38, pp. 1060-1073.
- Braithwaite (2001), Braithwaite, John, Rewards and Regulation. In: *Journal of Law and Society*, vol. 29, no. 1, pp. 12-26
- BRC (2001), British Retail Consortium, Technical standard for the supply of identity preserved non-genetically modified foods ingredients and product. London.
http://www.brc.org.uk/standards/downloads/nongm_std_background.pdf.
- BRC (2005), BRITISH RETAIL CONSORTIUM POSITION ON BRAZILIAN NON-GM SOYBEAN.

- BRC na., British Retail Consortium, BRC Response to the proposals for Regulations on: traceability and labelling of GMOs and GM products and GM food and feed. <http://www.brc.org.uk/Downloads/BRC%20Position%20on%20GM.pdf>.
- Brown (2001), Brown, D., GM field trials must use wider buffer zones. The Telegraph.
- Brown (2004), Brown, P., Minister to abolish GM scrutiny body [Online]. <http://www.guardian.co.uk/science/2004/dec/29/gm.greenpolitics>. Accessed: 05/11/2011.
- Brunsson (1982), Brunsson, Niels, The Irrationality of Action and Action Rationality: Decision, Ideologies and Organizational Action. In: Journal of Management Studies, vol. 19, no. 1, pp. 29-44.
- BSI (2011b), British Standards Institute (BSI), Nanotechnology [Online]. <http://shop.bsigroup.com/en/Browse-by-Subject/Nanotechnology/>. Accessed: 04/10/2011.
- BSI (2011a), British Standards Institute (BSI), Committee for Nanotechnologies [Online]. <http://shop.bsigroup.com/en/Browse-by-Subject/Nanotechnology/BSI-Committee-for-Nanotechnologies/>. Accessed: 30/09/2011.
- BUND (2009), Bund für Naturschutz und Umwelt, Nano-Silber – der Glanz täuscht, Immer mehr Konsumprodukte trotz Risiken für Umwelt und Gesundheit, under http://www.bund.net/fileadmin/bundnet/publikationen/nanotechnologie/20091202_nanotechnologie_nanosilber_studie.pdf (retrieved 28 February 2011).
- Carter Gruère (2003): Carter, Colin A./Gruère, Guillaume P., Mandatory Labelling of Genetically Modified Foods: Does it Really Provide Consumer Choice? In: The Journal of Agrobiotechnology Management and Economics, vol. 6, no.1/2, pp. 68-70.
- Ceddia Cerezo (2008), Ceddia, M.G./Cerezo E.R., A Descriptive Analysis of Conventional, Organic and GM Crop and Certified Seed Production in the EU, JRC (2008), under <http://ftp.jrc.es/EURdoc/JRC45170.pdf> (retrieved 28 February 2011).
- Chaudrhy et al. (2008), Applications and implications of nanotechnologies for the food sector, Food Additives & Contaminants: Part A: Chemistry, Analysis, Control, Exposure and Risk Assessment, Chaudrhy, Q., Scotter, M., Blackburn, J. et al., March 2008, Taylor & Francis; 25(3): 241–258
<http://dx.doi.org/10.1080/02652030701744538>
- Chemical News & Intelligence (2010a), Thomas Swan commissions carbon nanotube plant in the UK.
- Chemical News & Intelligence (2010b), UK can be global leader in nanotechnology - CIA. Chemical News & Intelligence.
- Chemical Watch (2007), Ask Dr REACH: Do biocides need to be registered under REACH, CW Briefing, December 2007.
- Chemical Watch (2011a), Speedier enforcement to be focus of "realistic" FCMs programme, says DG Sanco, CW Briefing of 12 December 2011.
- Chemical Watch (2011b), Nanomaterials: now we have a definition, what next?, CW Briefing, November 2011.
- Chemical Watch (2011c), Dutch call for progress on nanomaterials at EU level', Chemical-Watch, 9 March 2011.
- Chemical Watch (2012a), EU reaches agreement on tougher biocides Regulation, CW Briefing of 19 January 2012.

- Chemical Watch (2012b), Food contact materials lie within REACH. CW Briefing, February 2012.
- Codex Alimentarius Austriacus na., Codexrichtlinie zur Definition der "Gentechnikfreiheit.
- COGEM (2010), Commissie Genetische Modificatie, Geboeid door keuzevrijheid, Een verkenning van de ontwikkeling en rol van keuzevrijheid rondom GGO's in Europa, CGM/101230-01, 2010.
- Council (2008), Council, A. B., Genetically Modified Crops – Part of the Solution. <http://www.abcinformation.org/library/files/genetically.pdf>. Accessed on: 20/11/2011.
- Davies (2008), Davies, S., Nano-enabled choice. The Guardian.
- De Vriend na., H.C. de Vriend, GGO-vrije additieven en hulpstoffen voor biologische (dier-)voeding, ongedateerd, p.9 (www.lisconsult.nl).
- DEFRA (2011b), Department for Environment Food and Rural Affairs, Genetic modification (GM) [Online]. <http://www.defra.gov.uk/environment/quality/gm/>. Accessed: 20/11/2011.
- DEFRA (2011a), Department for Environment Food and Rural Affairs, Genetic modification [Online]. <http://www.defra.gov.uk/environment/quality/gm/>. Accessed: 28/10/2011.
- Dekkers (2010), S. Dekkers e C. de Heer, Tijdelijke nano-referentiewaarden, RIVM report 601044001/2010).
- DG Sanco (2006), Final report of a mission carried out in Germany from 06/03/2006 to 10/03/2006 concerning controls on food and feed containing, consisting of or produced from Genetically Modified Organisms, DG(SANCO)/8105/2006 – MR Final, under http://ec.europa.eu/food/fvo/act_getPDF.cfm?PDF_ID=5283
- ECHA (2008a), Stakeholder policy document from 13 February 2008. Download under: <http://echa.europa.eu/doc/opportunities/ECHASTakeholderPolicyDocument.pdf> (accessed on 13 April 2010).
- ECHA (2008b), Guidance on information requirements and chemical safety assessment, Part D: Exposure Scenario Building, version 1.1, May 2008, under: http://echa.europa.eu/documents/10162/13632/information_requirements_part_d_en.pdf
- ECHA (2010), Guidance on the communication of information on the risks and safe use of chemicals, European Chemical Agency, Version 1, December 2010, ECHA-2010-G-21-EN, under http://echa.europa.eu/documents/10162/17231/risk_communications_en.pdf
- ECHA (2011a), Guidance on Labelling and Packaging in accordance with Regulation (EC) No 1272/2008, European Chemical Agency, 04/2011, ECHA-11-G-EN, http://echa.europa.eu/documents/10162/17217/clp_labelling_en.pdf
- ECHA (2011b), Guidance on the preparation of socio-economic analysis as part of an application for authorisation, ECHA-11-G-02-EN, January 2011, under: http://echa.europa.eu/documents/10162/13637/sea_authorisation_en.pdf
- EFSA (2010), EFSA's Communications Strategy: 2010 – 2013 perspective, European Food Safety Authority, December 2010, mb 16 12 10 item 4 doc 3, under <http://www.efsa.europa.eu/en/keydocs/docs/commstrategyerspective2013.pdf>

- EFSA (2011), Note for Guidance for Petitioners presenting an Application for the Safety Assessment of a Substance to be used in Food Contact Materials prior to its Authorisation, European Food Safety Authority, Updated on 30/07/2008:
<http://www.efsa.europa.eu/en/efsajournal/doc/21r.pdf>
- Ethical Consumer na-a., Free buyers guide to Sleeping bags, from Ethical Consumer [Online].
<http://www.ethicalconsumer.org/buyersguides/traveltransport/sleepingbags.aspx>. Accessed: 10/10/2011.
- Ethical Consumer na-b., Free buyers guide to Tents, from Ethical Consumer [Online].
<http://www.ethicalconsumer.org/buyersguides/traveltransport/tents.aspx>. Accessed: 10/10/2011.
- Ethical Consumer na-c., Free shopping guide to Fleece Jackets, from Ethical Consumer [Online]. <http://www.ethicalconsumer.org/buyersguides/clothing/fleeces.aspx>. Accessed: 10/10/2011.
- Ethical Consumer na-d. Free shopping guide to Rucksacks, from Ethical Consumer [Online].
<http://www.ethicalconsumer.org/buyersguides/traveltransport/rucksacks.aspx>. Accessed: 10/10/2011.
- Ethical Consumer na-e., Free shopping guide to Walking Boots, from Ethical Consumer [Online]. <http://www.ethicalconsumer.org/buyersguides/clothing/walkingboots.aspx>. Accessed: 10/10/2011.
- Ethical Consumer na-f., Free shopping guide to Waterproof jackets, from Ethical Consumer [Online].
<http://www.ethicalconsumer.org/buyersguides/clothing/waterproofjackets.aspx>. Accessed: 10/10/2011.
- Ethical Consumer na-g., Nanotechnology [Online].
<http://www.ethicalconsumer.org/CommentAnalysis/Features/Nanotechnology.aspx>. Accessed: 10/10/2011.
- Ethical Consumer na-h., Sunscreens - Free shopping guide from Ethical Consumer [Online].
<http://www.ethicalconsumer.org/buyersguides/healthbeauty/sunscreens.aspx>. Accessed: 10/10/2011.
- Euractiv (2010), Nanotech presence in consumer goods growing, European Union Information Website, under <http://www.euractiv.com/de/node/499152> (retrieved 28 February 2011)
- Eurobarometer (2006), Special Eurobarometer 244b, Survey by TNS Opinion & Social for the European Commission, DG Research [Computer file ZA4415, Zentralarchiv für empirische Sozialforschung, Köln].
- Eurobarometer (2010a), Biotechnology, Special Eurobarometer 341 / Wave 73.1 – TNS Opinion & Social, October 2010, under http://ec.europa.eu/public_opinion/archives/ebs/ebs_341_en.pdf (retrieved 28 February 2011).
- Eurobarometer (2010b), Food-related risks, Special Eurobarometer 354 / Wave 73.5 – TNS Opinion & Social, November 2010, under http://ec.europa.eu/public_opinion/archives/ebs/ebs_354_en.pdf (retrieved 28 February 2011).
- European Commission (2001a), “European Governance”, COM(2001) 428 final, of 27 July 2001. Download under:

- <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2001:0428:FIN:EN:PDF>
(last checked on 9 September 2010).
- European Commission (2001b), White Paper Strategy for a future Chemicals Policy, Brussels, 27.2.2001, COM(2001) 88 final.
<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2001:0088:FIN:en:PDF>
- European Commission (2002a), Communication from the Commission on the Collection and Use of Expertise by the Commission: Principles and Guidelines. "Improving the knowledge base for better policies", COM(2002) 713 final of 11 December 2002. Download under:
<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2002:0713:FIN:EN:PDF>
(last checked on 9 September 2010).
- European Commission (2002b), Communication from the Commission on Impact Assessment, COM(2002) 276 final.
- European Commission (2002c), European Governance: Better Lawmaking, COM(2002) 275 final and Radaelli, Claudio M./ Meuwese, Anne C.M. (2009), Better Regulation in Europe: Between Public Management and Regulatory Reform.
- European Commission (2002d), On the Collection and Use of Expertise by the Commission: Principles and Guidelines ("Improving the knowledge base for better policies"), COM(2002) 713 final.
- European Commission (2002e), Towards a reinforced culture of consultation and dialogue - General principles and minimum standards for consultation of interested parties by the Commission, COM(2002) 704 Final.
- European Commission (2006), The appropriateness of existing methodologies to assess the potential risks associated with engineered and adventitious products of nanotechnologies. Modified opinion adopted on 10 March 2006. Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR).
- European Commission (2007a), Directorate-General for Agricultural and Rural Development: Economic Impact of Unapproved GMOs on EU Feed Imports and Livestock Production, Analysis, Brussels. See
http://ec.europa.eu/agriculture/envir/gmo/economic_impactGMOs_en.pdf (accessed on 05 June 2010).
- European Commission (2007b), Questions and Answers on the Regulation of GMOs in the European Union, MEMO/07/117, Brussels, 26 March 2007. See
<http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/07/117&format=HTML&aged=1&language=EN&guiLanguage=en> (accessed on 12 April 2010).
- European Commission (2008), Follow-up to the 6th Meeting of the REACH Competent Authorities for the implementation of Regulation (EC) 1907/2006 (REACH), Brussels, 16 December 2008, Doc. CA/59/2008 rev. 1,
<http://ec.europa.eu/environment/chemicals/reach/pdf/nanomaterials.pdf>
- European Commission (2009a), Third strategic review of Better Regulation in the European Union, COM(2009) 15 final. Download under
<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0015:FIN:EN:PDF>
(last checked on 9 September 2010).
- European Commission (2009b), The relevance of REACH Guidance Documents for dossier evaluation under the Biocidal Products Directive 98/8/EC, December 2009,
http://ihcp.jrc.ec.europa.eu/our_activities/health-

- env/risk_assessment_of_Biocides/doc/TNSG/Relevance%20of%20REACH%20guidance%20for%20dossier%20evaluation%20under%20BPD.pdf
- European Commission (2009c), Impact Assessment Guidelines, SEC(2009) 92, 15 January 2009,
http://ec.europa.eu/governance/impact/commission_guidelines/docs/iag_2009_en.pdf.
- European Commission (2009d), Part III: Annexes to the Impact Assessment Guidelines, 15 January 2009,
http://ec.europa.eu/governance/impact/commission_guidelines/docs/ia_guidelines_annexes_en.pdf.
- European Commission (2010), Smart Regulation in the European Union, COM(2010) 543 final. Download under
http://ec.europa.eu/governance/better_regulation/documents/com_2010_0543_en.pdf (last checked on 20 October 2010).
- European Commission (2011), Commission Recommendation of 18 October 2011 on the definition of nanomaterial (Text with EEA relevance), (2011/696/EU),
<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:275:0038:0040:EN:PDF>
- Evira (2011). Eviran J., Rehu- ja lannoitevalvonnan analyysitulokset 2/2010. 6/2011, Helsinki.
- FAOStat (2011), <http://faostat.fao.org/default.aspx> (TRADEstat on FAOstat).
- FAZ (2011), Protest in Berlin – Tausende demonstrieren gegen Massentierhaltung, Frankfurter Allgemeine Zeitung, 22 January 2011, under
<http://www.faz.net/s/Rub0E9EEF84AC1E4A389A8DC6C23161FE44/Doc~EABBD827826D942A48203AB1665CD05AC~ATpl~Ecommon~Scontent.html> (retrieved 28 February 2011).
- FCEC (2011), Evaluation of the EU legislative framework in the field of GM food and feed - Framework Contract for evaluation and evaluation related services - Lot 3: Food Chain, Final Report, July 2010, submitted by: Food Chain Evaluation Consortium (FCEC) - Civic Consulting, Agra CEAS Consulting, Van Dijk Management Consultants, Arcadia International.
http://ec.europa.eu/food/food/biotechnology/evaluation/docs/evaluation_gm_report_en.pdf
- FERA (2008), Food and Environmental Research Agency, No Small Matter [Online].
<http://www.fera.defra.gov.uk/showNews.cfm?id=314>. Accessed: 04/10/2011.
- Fiedeler Nentwich et al. (2010), Fiedeler, U./Nentwich, M. et al., Voluntary approaches by industry in the field of nanomaterials, nanotrust dossiers no. 016, December 2010, under <http://epub.oeaw.ac.at/ita/nanotrust-dossiers/dossier016en.pdf> (retrieved 28 February 2011).
- FOE (2003), Friends of the Earth, Genetically modified crops and food.
http://www.foe.co.uk/resource/briefings/gm_crops_food.pdf. Accessed on: 03/11/2011.
- FOE (2010), Friends of the Earth, Nanotechnology, climate and energy: over-heated promises and hot air? (UK Edition).
http://www.foe.co.uk/resource/reports/nanotechnology_climate.pdf.
- Foodwatch (2010), 72.000 Bürger für Burger ohne Gentechnik, 20 December 2010,
http://foodwatch.de/kampagnen_themen/mcdonalds/unterschriften_uebergabe/index_ger.html (retrieved 28 February 2011).

- Foscht Swoboda (2007), Foscht, Thomas/Swoboda, Bernhard, Käuferverhalten: Grundlagen – Anwendungen – Perspektiven. 3. Aufl., Gabler, Wiesbaden.
- Frater (2006), Frater, L., An Overview of the Framework of Current Regulation Affecting the Development and Marketing of Nanomaterials: A Report for the DTI. London: Department of Trade and Industry. <http://www.bis.gov.uk/files/file36167.pdf>. Accessed on: 30/09/2011.
- FSA (2003), Food Standards Agency, GM Food: Opening up the debate. London.
- FSA (2008), Food Standards Agency, Food: The Use of Genetic Modification – A Public Dialogue [Online]. London: <http://www.food.gov.uk/gmfoods/gm/gmdialogue/>.
- FSA (2009), Food Standards Agency, Quarterly Public Attitudes Tracker: September 2009. London. <http://www.food.gov.uk/multimedia/pdfs/fsatrackersurvey.pdf>.
- FSA (2011b), Views on nanotechnology: research published. London. <http://food.gov.uk/multimedia/pdfs/publication/fsacfnanotechnologyfood.pdf>.
- FSA (2010), Food Standards Agency, Nanotechnology: what's the big issue? Bite: The food standards agency magazine with teeth (2).
- FSA (2011a), Food Standards Agency, Biannual Public Attitudes Tracker: July 2011. London. <http://www.food.gov.uk/multimedia/pdfs/biannualpublicattitudetrack.pdf>.
- Führ et al. (2007), Legal appraisal of nano technologies, Reachtsgutachten Nano-Technologie – ReNaTe, Forschungsbericht 363 01 108, UBA-FB 000996, UBA-Texte 10/07, ISSN 1862-4804, <http://www.umweltdaten.de/publikationen/fpdf-l/3198.pdf>
- Führ Bizer Feindt (2007), Führ, Martin/Feindt, Peter H./Bizer, Kilian Politisches Entscheiden: Wie kann die Wissenschaft dazu etwas beitragen? In: Führ, Martin/Bizer, Kilian/Feindt, Peter H. (Hrsg.), Menschenbilder und Verhaltensmodelle in der wissenschaftlichen Politikberatung. Baden-Baden, Interdisziplinäre Studien zu Recht und Staat, Nomos-Verlag.
- GeneWatch UK (2000), SUGAR BEET AND FODDER BEET. Fact Sheet 4.
- GeneWatch UK (2009a), Agrofuels and the use of Genetic Modification. Buxton. http://www.genewatch.org/uploads/f03c6d66a9b354535738483c1c3d49e4/Genewatch_Report_August_2009.pdf.
- GeneWatch UK (2009b), GeneWatch PR: Response to Royal Society agriculture report [Online]. [http://www.genewatch.org/article.shtml?als\[cid\]=563486&als\[itemid\]=565524](http://www.genewatch.org/article.shtml?als[cid]=563486&als[itemid]=565524). Accessed: 20/10/2011.
- GeneWatch UK na-a., About GeneWatch [Online]. <http://www.genewatch.org/sub-396416>.
- GeneWatch UK na-b., GM crops and foods in Britain and Europe [Online]. Buxton: <http://www.genewatch.org/sub-568547>.
- Gezondheidsraad (2006), Gezondheidsraad, advisory report 2006, Health Significance of nanomaterials, The Hague: 2006.
- Ghosh (2010), Ghosh, P., Food industry 'too secretive' over nanotechnology. BBC.
- GM Food News (2000), Genetically Modified Food - Who's doing what? [Online]. <http://www.gmfoodnews.com/gmwho.html>.

- GM Freeze (2005), British Retailers Call On Brazil To Stand Firm On GM-Free Soya [Online]. <http://www.gmfreeze.org/news-releases/148/>. Accessed: 10/10/2011.
- GM Freeze (2011a), List of products containing GM in the UK [Online]. <http://www.gmfreeze.org/actions/5/>. Accessed: 20/10/2011.
- GM Freeze (2011b), UK GM field trials [Online]. <http://www.gmfreeze.org/why-freeze/uk-field-trials/>.
- GM Freeze (2011c), What Supermarkets Say about GM Feed [Online]. <http://www.gmfreeze.org/why-freeze/unwanted/what-supermarkets-say-about-gm-feed/>. Accessed: 01/11/2011.
- GM-Free Cymru (2009), Secret GM farmer faces prosecution calls [Online]. http://www.gmfreecymru.org.uk/news/Press_Notice26Jan2009.htm. Accessed: 19/10/2011.
- GM-Free Cymru (2011), WHAT IS THE SITUATION IN WALES? [Online]. <http://www.gmfreecymru.org/wales.htm>. Accessed: 09/10/2011.
- GMO Compass (2006), Country Reports: Coexistence in the UK [Online]. http://www.gmo-compass.org/eng/news/country_reports/242.coexistence_uk.html.
- GMO Compass (2008), GM Crops The Big Four: Soybean, Maize, Rapeseed and Cotton [Online]. http://www.gmo-compass.org/eng/grocery_shopping/crops/. Accessed: 01/11/2011.
- GMO Compass (2009a), Chop-chop: EU Commission approves GM maize MIR604 [Online]. <http://www.gmo-compass.org/eng/news/479.docu.html>. Accessed: 01/11/2011.
- GMO Compass (2009b), EU Commission give approval for genetically modified maize: Relaxation in the dispute on animal feed imports [Online]. <http://www.gmo-compass.org/eng/news/472.docu.html>. Accessed: 01/11/2011.
- GMO Compass (2009c), GM linseed: Products being taken off the market [Online]. <http://www.gmo-compass.org/eng/news/467.docu.html>. Accessed: 02/11/2011.
- GMO Compass (2009d), An overview of European consumer polls on attitudes to GMOs [Online]. http://www.gmo-compass.org/eng/news/stories/415.an_overview_european_consumer_polls_attitudes_gmo_s.html. Accessed: 01/11/2011.
- GMO Compass (2009e), UK consumers more relaxed than ever about GM food [Online]. <http://www.gmo-compass.org/eng/news/461.docu.html>. Accessed: 02/11/2011.
- GMO Compass (2009f), United Kingdom: Supermarkets hardly can further avoid gene-technology food products [Online]. <http://www.gmo-compass.org/eng/news/464.docu.html>. Accessed: 02/11/2011.
- GMO Compass (2010a), Amflora potatoes planted in Germany [Online]. <http://www.gmo-compass.org/eng/news/507.docu.html>. Accessed: 02/11/2011.
- GMO Compass (2010b), EU Commission grants planting of the Amflora potato [Online]. <http://www.gmo-compass.org/eng/news/491.docu.html>. Accessed: 01/11/2011.
- GMO Compass (2010c), EU Commission: Import approval for six GM maize lines [Online]. <http://www.gmo-compass.org/eng/news/526.docu.html>. Accessed: 02/11/2011.
- GMO Compass (2010d), GM potatoes: BASF at work [Online]. <http://www.gmo-compass.org/eng/news/492.docu.html>. Accessed: 01/11/2011.

- GMO Compass (2011a), EU: The first harvest of the Amflora potato [Online].
<http://www.gmo-compass.org/eng/news/534.docu.html>. Accessed: 01/11/2011.
- GMO Compass (2011b), GMO Database [Online].
<http://www.gmo-compass.org/eng/gmo/db/>. Accessed: 02/11/2011.
- GMO Compass (2011c), Spain: Bt maize keeps going [Online].
<http://www.gmo-compass.org/eng/news/549.docu.html>. Accessed: 01/11/2011.
- Grabner Torgersen (1998), Grabner, P., Torgersen, H., Österreichs Gentechnikpolitik - Technikkritische Vorreiterrolle oder Modernisierungsverweigerung? Österreichische Zeitschrift für Politikwissenschaft 1/98, pp. 5-27
- Grabner na., Grabner, P., Ein Subsidiaritätstest – Die Errichtung gentechnikfreier Regionen in Österreich zwischen Anspruch und Wirklichkeit. ITA manu:scripts 05_02.
http://epub.oeaw.ac.at/ita/ita-manuscript/ita_05_02.pdf
- Graham-Rowe (2008), Graham-Rowe, D., Black gold. The Guardian.
- Graham-Rowe (2011), Graham-Rowe, D., Can nanotechnology provide cheaper solar energy? The Guardian.
- Gray (2008), Gray, F., Nanosilver fad poses 'serious risk to health'. The Scotsman.
- Gray (2010), Gray, L., Supermarkets selling meat from animals fed GM crops. The Telegraph.
- Green Peace (2000), Greenpeace welcomes Iceland going GM free [Online].
<http://www.greenpeace.org.uk/media/press-releases/greenpeace-welcomes-iceland-going-gm-free>. Accessed: 01/11/2011.
- Green Peace na., UK government trials show GM crop bad news for the environment [Online].
<http://www.greenpeace.org.uk/gm/uk-government-trials-show-gm-crop-bad-news>. Accessed: 19/10/2011.
- Greenpeace (2010), Gen-Alarm bei Speiseölen, 09/2011, under
http://www.greenpeace.de/fileadmin/gpd/user_upload/themen/gentechnik/Genalarm_neu_Speiseoele_20.9.2010.pdf (retrieved 28 February 2011).
- Greenpeace (2011), Gen-Alarm bei Asia-Produkten, Döner & Co., 02/2011,
http://www.greenpeace.de/fileadmin/gpd/user_upload/themen/gentechnik/Genalarm_neu_Asia-Produkte_u.a._11.02.2011.pdf (retrieved 28 February 2011).
- Greßler Fries (2010), Nanosilber in Kosmetik, Hygieneartikeln und Lebensmittelkontaktmaterialien – Produkte, gesundheitliche und regulatorische Aspekte, Bundesministerium für Gesundheit (Ed.), Februar 2010, ISBN: 978-3-902611-32-1,
http://bmg.gv.at/cms/home/attachments/9/7/2/CH1180/CMS1288805248274/bmg_nanosilber_fassung_veroeffentlichung_final__mit_deckblaetter1.pdf
- Grice (2009), Grice, A., Government launches bid to allay fears over GM food. The Independent.
- Grobe (2007), Grobe, A., Europa setzt auf Dialoge: Neue Wege der (Risiko-) Kommunikation für Nanotechnologien in "Nano – Chancen und Risiken aktueller Technologien", André Gaszó, Sabine Greßler, Fritz Schiemer (ed.), Springer Wien New York (2007).
- Groves (2011), Groves, C., Nanotechnology in the UK, 2011-2020: A Delphi Exercise. Cardiff: The Centre for Business Relationships, Accountability, Sustainability & Society (BRASS), Cardiff University.
- Groves Stokes Lee Frater Oriola (2008), Groves, C., Stokes, E., Lee, R., Frater, L. and Oriola, T., Nanotechnology and the Regulatory Environment: A Synopsis. BRASS Working Pa-

- per. <http://www.brass.cf.ac.uk/brassresources/WP48FullPaper.pdf>. Accessed on: 29/09/2011.
- Gruère Rao (2007), Gruère, Guillaume P./Rao, S.R., A Review of International Labelling Policies of Genetically Modified Food to Evaluate India's Proposed Rule. In: *The Journal of Agrobiotechnology Management and Economics*, vol. 10, no.1, pp. 51-64.
- Guardian (2008), Guardian, T., GM crop trial locations may be hidden from public [Online]. London: <http://www.guardian.co.uk/environment/2008/feb/16/gmcrops.greenpolitics>.
- Gusfield (1992), Gusfield, J. R., Nature's body and the metaphors of food. In M. Lamont & M. Fournier (Eds.), *Cultivating differences: symbolic boundaries and the making of inequality* (pp. 75-103). Chicago: The University of Chicago Press.
- Hampton (2005), Hampton, Philip, *Reducing administrative burdens: effective inspection and enforcement*. HM Treasury. Norwich.
- Harrington (2011), Harrington, R., UK mulls confidentiality pact with industry over nano research [Online]. [FoodproductionDaily.com](http://www.foodproductiondaily.com/Quality-Safety/UK-mulls-confidentiality-pact-with-industry-over-nano-research).
<http://www.foodproductiondaily.com/Quality-Safety/UK-mulls-confidentiality-pact-with-industry-over-nano-research>.
- Hatto na., Hatto, P., An introduction to standards and standardization for nanotechnologies [Online].
<http://shop.bsigroup.com/upload/Standards%20&%20Publications/Nanotechnologies/Nano%20Website%20Presentation%20BSI%20template%20December%202010.ppt>. Accessed: 04/10/2011.
- Hinsliff (2009), Hinsliff, G., New science could defeat food crises. *The Observer*.
- HM Government (2005), *Response to the Royal Society and Royal Academy of Engineering Report: Nanoscience and nanotechnologies*.
- HM Government (2009), House of Lords Select Committee on Science and Technology inquiry into Nanotechnologies and Food. <http://www.parliament.uk/documents/lords-committees/science-technology/st115professorrichardaljones.pdf>.
- HM Government (2010a), *Government Response to the Lord's Science & Technology Select Committee Report into Nanotechnologies and Food*. <http://www.official-documents.gov.uk/document/cm78/7857/7857.pdf>. Accessed on: 04/11/2011.
- HM Government (2010b), *UK Nanotechnologies Strategy Small Technologies, Great Opportunities*. London.
- Hoste Bolhuis (2010), R. Hoste en J. Bolhuis, *Sojaverbruik in Nederland*, LEI Wageningen UR, Den Haag 2010, p.9-10, 30-31.
- ICCA (2006), *Responsible Care Global Charter*, International Council of Chemical Associations, March 2006, under http://www.icca-chem.org/ICCADocs/07_RCGC_suppl_to_chemicalweek_Mar2006.pdf (retrieved 28 February 2011).
- Iceland Foods (2011). *Corporate Responsibility* [Online]. <http://www.iceland.co.uk/about-iceland/corporate-responsibility/>. Accessed: 02/11/2011.
- ISO (2011), International Organisation for Standards, TC 229 Nanotechnologies [Online]. http://www.iso.org/iso/iso_technical_committee?commid=381983. Accessed: 04/10.2011.

- ITA (2009), NanoTrust-Dossier 010en. Nanosilver. Institute for Technology Assessment of the Austrian Academy of Sciences. Available at: <http://epub.oew.ac.at/ita/nanotrust-dossiers/dossier010en.pdf>. (accessed 28 March 2011).
- ITA (2011a), NanoTrust-Dossier 018en. Nano Regulation in Austria (I): Chemical and Product Safety. Institute of Technology Assessment of the Austrian Academy of Sciences. Available at: <http://epub.oew.ac.at/ita/nanotrust-dossiers/dossier018en.pdf>. (accessed 28 March 2011).
- ITA (2011b), NanoTrust-Dossier 019en. Nano Regulation in Austria (II): Workplace Safety, Industrial Law and Environmental Law. Institute of Technology Assessment of the Austrian Academy of Sciences. Available at: <http://epub.oew.ac.at/ita/nanotrust-dossiers/dossier019en.pdf>. (accessed 28 March 2011).
- Jany (2009), Jany, K.D. in :Lebensmittelrecht – Kommentar, Zipfel, W.; Rathke, K.-D. (ed.) 139. edition 2010, C.H. Beck 2010, ISBN: 978-3-406-329820-9.
- Jha (2011a), Jha, A., Nanotechnology world: Nanomedicine offers new cures.
- Jha (2011b), Jha, A., Nanotechnology is providing a 'toolkit' for advances in many areas of science. The Guardian.
- Jones (2009), Jones, E., Oral - GM Crops [Online]. Welsh Government. <http://wales.gov.uk/about/cabinet/cabinetstatements/2009/gm/?lang=en>. Accessed: 20/11/2011.
- Jowit Vidal (2010), Jowit, J. and Vidal, J., Environment secretary Caroline Spelman backs GM crops. The Guardian.
- Judy Unrine Bertsch (2010), Judy, J. D., Unrine, J. M. and Bertsch, P. M., Evidence for Biomagnification of Gold Nanoparticles within a Terrestrial Food Chain. Environmental Science & Technology 452, pp. 776-781.
- Just Food (2011). UK: Consumers open to nanotechnology - FSA.
- Kabinettsvisie nanotechnologie (2008), Van klein naar groots, Kamerstukken II 2006/07, 29 338, nr. 54.
- Kajander Koponen (2008), Kajander, J-K. and P. Koponen. Nanotechnology in Finnish industry 2008 – survey results. Spinverse & Tekes. http://www.spinverse.com/documents/Nanotechnology_in_Finnish_Industry_2008.pdf Accessed 15/3/2011.
- KEMI (2011), Antibakteriella ämnen läcker från kläder vid tvätt – analys av silver, triklosan och triklokarban i textilier före och efter tvätt, PM 4/11, December 2011, http://www.kemi.se/Documents/Publikationer/Trycksaker/PM/PM4_11.pdf
- Lehmann Nielsen (2006), Lehmann Nielsen, Vibeke, Are Regulators Responsive? In: Law & Policy, vol. 28, no. 3, pp. 395-416.
- Lehmann Nielsen Parker (2009), Lehmann Nielsen, Vibeke/Parker, Christine, Testing responsive regulation in regulatory enforcement. In: Regulation and Governance, vol. 3, pp. 376-399.
- LEL (2010), Landesanstalt für Entwicklung der Landwirtschaft und der Ländlichen Räume (LEL), Jahresheft Agrarmärkte 2010, under http://www.landwirtschaft-bw.info/servlet/PB/show/1316671/LEL_AM10_03_Oelsaaten%20und%20Eiwei%DFpflanzanzen_%28Text%29.pdf. (retrieved 28 February 2011).
- Litosseliti (2003), Litosseliti, L., Using focus groups in research. London and New York: Continuum.

- LNV Consumentenplatform (2009), Nanotechnologie 'Klein maar fijn?', ministerie van Landbouw, Na-tuurbeheer en Voedselkwaliteit, 2009.
- Loader Henson (1998), Loader, R. and Henson, S., A View Of GMOs From The UK. *Journal of Agrobiotechnology Management & Economics* 1(1), pp. 31-34.
- Löfstedt (2004): Löfstedt, Ragnare E., The Swing of the Regulatory Pendulum in Europe: From precautionary Principle to (Regulatory) Impact Assessment, *The Journal of Risks and Uncertainty*, 28:3, 237-260, 2004.
- Lucas (2010), Lucas, C., Europe's new GM laws offer hope – but we must remain vigilant.
- Lux Research (2006), Nanotech Report 4th Edition. New York: Lux Research Inc.
- Malkiewicz et al (2011), Nanomaterials in REACH, evaluation of applicability of existing procedures for chemical safety assessment to nanomaterials, project report, Malkiewicz K., Pettitt M., Dawson K. A. et al, funded by SKEP ERA-NET.
- May (2005), May, Peter J., Compliance Motivations: Perspectives of Farmers, Homebuilders and Marine Facilities. In: *Law & Policy*, Vol. 27, No. 2, pp. 317-347
- McColm (2011), McColm, Helen, Smart Regulation: The European Commission's Updated Strategy, *EJRR* 1/2011.
- Meyer (2010), Aktionismus oder wahrer Fortschritt? Vollzogene und geplante Anpassung europarechtlicher Regelungen aufgrund möglicher Risiken durch Nanomaterialien, Meyer, M., *StoffR* 1/2010.
- Mini-IGT (2010), Mini Innovation & Growth Team, Nanotechnology: A UK Industry View. http://www.matuk.co.uk/docs/Nano_report.pdf. Accessed on: 30/09/2011.
- Müller Nowack (2008), Müller N.C./Nowack B., Exposure Modeling of Engineered Nanoparticles in the Environment. *Environmental Science Technology* 42: 4447-4453. p. 4448.
- NanoKommission (2008), Verantwortlicher Umgang mit Nanotechnologie, Bericht und Empfehlung der NanoKommission der deutschen Bundesregierung 2008, http://www.bmu.de/files/pdfs/allgemein/application/pdf/nanokomm_abschlussbericht_2008.pdf (retrieved 28 February 2011).
- NanoKommission (2011), Verantwortlicher Umgang mit Nanotechnologie, Bericht und Empfehlung der NanoKommission 2011, http://www.bmu.de/files/pdfs/allgemein/application/pdf/nano_schlussbericht_2011_bf.pdf (retrieved 28 February 2011).
- NanoKTN (2011), Nanotechnology Knowledge Transfer Network, Nanotechnology Knowledge Transfer Network Annual Report 2010-11. Sedgefield. https://ktn.innovateuk.org/c/document_library/get_file?p_l_id=70035&folderId=100091&name=DLFE-39379.pdf. Accessed on: 06/10/2011.
- Nanopodium (2009), Rapport 0-meting Nanopodium, Schuttelaar & Partners, commissioned by Commissie Maatschappelijke Dialoog Nanotechnologie, September 2009.
- Nanopodium (2010), Rapport 1-meting Nanopodium, MarketResponse, commissioned by Commissie Maatschappelijke Dialoog Nanotechnologie, December 2010.
- Nanopodium (2011), Commissie Maatschappelijke Dialoog Nanotechnologie, Verantwoord verder met nanotechnologie, bevindingen maart 2009-januari 2011, 2011.
- Nanoposts.com (2009), Nanotechnology in the United Kingdom: Programmes, Networks, Funding, Research Groups and Companies.
- NFU (2011), Coalition Government policy on GM crops. www.nfuonline.com/Our.../UK-Government-position-on-GM-2011/.

- NTKTN (2011), Nanotechnology Knowledge Transfer Network Annual Report 2010-11. Sedgefield.
https://ktn.innovateuk.org/c/document_library/get_file?p_l_id=70035&folderId=100091&name=DLFE-39379.pdf. Accessed on: 06/10/2011.
- Nunn (2000), Nunn, J., What Lies Behind The GM Label On UK Foods. *AgBioForum* 3(4), pp. 250-254.
- Oakdene Hollins (2007), Environmentally Beneficial Nanotechnologies: Barriers and Opportunities. Department for Environment, Food and Rural Affairs.
<http://archive.defra.gov.uk/environment/quality/nanotech/documents/envbeneficial-report.pdf>.
- Obradovic Vizcaino (2006), Good Governance requirements concerning the participation of interest groups in EU consultations, CMLR 43, 1049-1085, 2006.
- Oliphant (2008), Oliphant, K., Economic Loss Caused by GMOs in the United Kingdom: England & Wales Economic Loss Caused by Genetically Modified Organisms. In: Koch, B.A. ed., Vol. 24. Springer Vienna, pp. 505-527.
- Schenkelaars de Vriend (2010), P. Schenkelaars and H. de Vriend, Report of Interviews with CSOs in the Netherlands on NanoCode, 4 November 2010, especially p. 3-5 (www.sbcbiotech.nl).
- PEN (2011a), Project for Emerging Nanotechnologies, Analysis [Online].
http://www.nanotechproject.org/inventories/consumer/analysis_draft/. Accessed: 07/10/2011.
- PEN (2011b), Project on Emerging Nanotechnologies, Consumer Products [Online].
<http://www.nanotechproject.org/inventories/consumer/>.
- PEN (2011c), Project on Emerging Nanotechnologies, Updates [Online].
<http://www.nanotechproject.org/inventories/consumer/updates/>. Accessed: 7/10/2011.
- Policy letter (2008), Kamerstukken II 2008/09, 29 338, nr. 80. Actieplan nanotechnologie 2008: Kamerstukken II 2007/08, 29 338, nr. 75.
- Policy letter (2009), Kamerstukken II 2009/10, 29 338, nr. 90. Actieplan nanotechnologie, voortgangsrapportage: Progress report Actionplan nanotechnology, Kamerstukken II 2009/10, 32 360 XIII, nr. 1.
- Policy letter (2011), Kamerstukken II 2010/11, 29 338, nr. 100. Report Parliamentary meeting 2011, Kamerstukken II, 2010/11, 29 338, nr.103.
- Pollitt (2008), Pollitt, M., Tuning in to the possibilities of nanotube transistors. *The Guardian*.
- POST (2004). Parliamentary Office of Science and Technology, GM CROPS IN THE UK.
<http://www.parliament.uk/documents/post/postpn211.pdf>.
- Poulter (2008), Poulter, S., Milk, cheese and pork 'are being invaded by GM'. *Daily Mail*.
- Poulter (2009), Poulter, S., Supermarkets in 'secret talks to introduce GM foods to the shelves'. *Daily Mail*.
- Pronk et al (2009), Nanomaterials under REACH - Nanosilver as a case study, National Institute for Public Health and the Environment, M.E.J. Pronk et al., Report 601780003/2009,
<http://www.rivm.nl/bibliotheek/rapporten/601780003.pdf>
- Quintavalla Vicini (2002), Antimicrobial food in meat industry, Quintavalla, S., Vicini, L., Elsevier Science Ltd., *Meat Science* 62(2002), 373-380,

- Radaelli (2009), Radaelli, Claudio M. Regulating Rule-Making via Impact Assessment, *Governance: An International Journal of Policy, Administration, and Institutions*, Vol. 23, No. 1, January 2010, pp. 89–108.
- Radaelli Meuwese (2009), Radaelli, Claudio M./ Meuwese, Anne C.M, *Better Regulation in Europe: Between Public Management and Regulatory Reform*, Public Administration Vol. 87, No. 3, 2009, (639-654).
- Ramsay, Iain (2006), *Consumer Law, Regulatory Capitalism and the 'New Learning' in Regulation*. In: *Sydney Law Review*, vol. 28, no. 9, pp. 9-35
- Rask (2006). Rask, M., Closure in risk debates. Pre-assessment of Finnish forest biotechnology. *Technological Forecasting and Social Change* 73, 705-730.
- Rathenau (2009), *Nederland Nanoland, Notitie rondetafel Nanotechnologie van de Vaste Kamercommissie voor Economische Zaken*, 3 juni 2009 (www.rathenau.nl/nanodialoog).
- RCEP (2008), *Royal Commission on Environmental Pollution, Novel Materials in the Environment: The case of Nanotechnology*. London.
- Rijk Veraart (2010), *Global Legislation for Food Packaging Materials*, Rijk, R. Veraart, R. (ed.), Wiley-VCH 2010, ISBN: 978-3-527-31912-1.
- RIVM (2007a), S. Dekkers et al., *Inventory of consumer products containing nanomaterials*, RIVM/SIR, Advisory report 11124, 2007.
- RIVM (2007b), H. Bouwmeester et al., *Health impact of nanotechnologies in food production*, Rikilt and RIVM, Report 2007.014, 2007.
- RIVM (2010), S. Dekkers et al. (RIVM), 'Presence and risks of nanosilica in food products', *Nanotoxicology* 2010, Early Online, p. 1-13.
- RIVM (2010b), S. Dekkers en C. de Heer, *Tijdelijke nano-referentiewaarden*, RIVM report 601044001/2010 (in Dutch).
- RNCOS (2008), *Nanotechnology Market Forecast to 2011*. <http://www.researchandmarkets.com/reports/c89494>. Accessed on: 30/09/2011.
- Roller (2005), *Die Genehmigung zum Inverkehrbringen gentechnisch veränderter Produkte und ihre Anpassung an Änderungen des Standes der Wissenschaft*, Roller, G., ZUR 3/2005.
- RSC (2011), *Nanotech Decade* [Online]. <http://www.rsc.org/chemistryworld/restricted/2011/March/NanotechDecade.asp>. Accessed: 30/09/2011.
- Sample (2008), Sample, I., *Use of nanoparticles in cosmetics questioned*. The Guardian.
- Sandy Lawrie na., *Novel Foods Unit Chemical Safety Division Nanotechnologies and food: FSA update*.
- Schenten (2011), *Nanomaterials and European Novel Food law: The uncertain path to reasonable regulation*, *elni Review* 1/2011, *Environmental Law Network International (elni)* 2011. p. 8-14.
- SCIMAC na., *Code of Practice* [Online]. <http://www.scimac.org.uk/codeofpractice.html>. Accessed: 20/11/2011.
- Scottish Government (2011a), *Genetic Modification - Research* [Online]. <http://www.scotland.gov.uk/Topics/farmingrural/Agriculture/Environment/15159/research>.

- Scottish Government (2011b), Genetic Modification (GM) Legislation [Online].
<http://www.scotland.gov.uk/Topics/farmingrural/Agriculture/Environment/15159/legislation>. Accessed: 20/11/2011.
- Scottish Government (2011c), Scottish Government Policy on Genetically Modified (GM) Crops [Online].
<http://www.scotland.gov.uk/Topics/farmingrural/Agriculture/Environment/15159>.
- SER (2009), Sociaal Economische Raad, Nanoparticles in the workplace, Advisory report, The Hague: 2009.
- Sirinathsinghji (2011), Sirinathsinghji, D. E., UK Supermarkets to label GM Soybean 'Sustainable' [Online]. Institute for Science in Society.
http://www.i-sis.org.uk/UK_Supermarkets_to_label_GM_soybean_sustainable.php. Accessed: 01/11/2011.
- Smithers (2008), Smithers, R., Soil Association bans nanomaterials from organic products. The Guardian.
- Soil Association (2008a), Annual Review.
<http://www.soilassociation.org/LinkClick.aspx?fileticket=Moyw3Q7H%2Fp4%3D&tabid=303>.
- Soil Association (2008b), Land of the GM-Free? How the American public are starting to turn against GM food. Bristol.
<http://www.soilassociation.org/LinkClick.aspx?fileticket=NOPEfS7855A%3d&tabid=390>.
- Soja Barometer (2009), Nederlandse Soja Coalitie (Dutch Soy Coalition), Soja Barometer 2009.
- Somsen (2010), H. Somsen, Introductie van Genetisch Gemodificeerde Organismen: Analyse van de Rechtspraak van de Afdeling bestuursrecht van de Raad van State, Tilburg 2010 (in Dutch). In many cases NGOs are an appelland party.
- Steffensen Below Merenyi (2009), Neue Ansätze zur Risikokommunikation – Produktinformationen vor dem Hintergrund von REACH, GHS und Nanotechnologie, Steffensen, B.; Below, N.; Merenyi, S., sofia Bericht sb02, Darmstadt 2009, ISBN: 978-3-933795-93-1.
- Stobbe (2011), Stobbe, Heinz-Günter, European Governance. Ein Beitrag zu ihrem normativen Fundament, in Simonis, G., Elbers, H. (ed.): Externe EU-Governance, VS Verlag 2011
- Stokes, E. (2009), Regulating nanotechnologies: sizing up the options. Legal Studies 29 (2), pp. 281-304.
- Stop GM (2010), GM in Our Countryside [Online]. <http://www.stopgm.org.uk/gm-in-britain/gm-in-countryside.html#10sym>. Accessed: 14/10/2011.
- Stop GM (2011), GM Health Risks [Online]. <http://www.stopgm.org.uk/whats-wrong-with-gm/gm-health-risks.html>. Accessed: 14/11/2011.
- Streeck (1987), Streeck, Wolfgang, Vielfalt und Interdependenz: Überlegungen zur Rolle von intermediären Organisationen in sich ändernden Umwelten. In: Kölner Zeitschrift für Soziologie und Sozialpsychologie, 39. Jg., H.3, S. 471-495.
- Stuart (2011), Stuart, C., Are nanotextiles making fabric laws wear thin? The Guardian.
- Swain (2011), Swain, F., Nanaotechnology world: Graphene: a 'miracle material' in the making. The Guardian.

- Technology Review (2011), Deutschland ist im Moment nicht Vorreiter by Niels Boeing, 17 February 2011, under <http://www.heise.de/tr/artikel/Deutschland-ist-im-Moment-nicht-Vorreiter-1190889.html> (retrieved 28 February 2011).
- Technology Strategy Board (2009), Nanoscale Technologies. Swindon.
https://ktn.innovateuk.org/c/document_library/get_file?p_l_id=70035&folderId=100091&name=DLFE-726.pdf.
- The Royal Society & The Royal Academy of Engineering (2003), Nanoscience and Nanotechnologies.
- The Royal Society & The Royal Academy of Engineering (2004), Nanoscience and nanotechnologies: opportunities and uncertainties.
<http://www.nanotec.org.uk/report/Nano%20report%202004%20fin.pdf>.
- The Royal Society (1998), GENETICALLY MODIFIED PLANTS FOR FOOD USE. London.
http://royalsociety.org/uploadedFiles/Royal_Society_Content/policy/publications/1998/10135.pdf.
- The Royal Society (2006), How can business respond to the technical, social and commercial uncertainties of nanotechnology? Workshop report. London.
http://www.responsiblenanocode.org/documents/Workshop-Report_07112006.pdf.
Accessed on: 30/09/2011.
- The Royal Society (2009), Reaping the benefits. Science and the sustainable intensification of global agriculture. London: The Royal Society.
http://royalsociety.org/uploadedFiles/Royal_Society_Content/policy/publications/2009/4294967719.pdf.
- The Soil Association (2008), Silent Invasion: The hidden use of GM crops in livestock feed.
<http://www.soilassociation.org/LinkClick.aspx?fileticket=bkVSpF9FMZc%3d&tabid=390>.
- The Soil Association (2011), The Road to 2020: Towards healthy, humane and sustainable food, farming and land use.
<http://www.soilassociation.org/Portals/0/The%20road%20to%202020.pdf>. Accessed on: 10/10/2011.
- Tömmel (2008), Tömmel, Ingeborg Governance und Policy-Making im Mehrebenensystem der EU, in Tömmel (ed.): Die Europäische Union – Governance und Policy-Making, 2008, PVS Sonderheft 40/2007,
- Torgersen (2002), Torgersen, H., Austria and the Transatlantic Agricultural Biotechnology Divide, *Science Communications* 24, 2, 173-183
- Torgersen Bogner (2005), Torgersen, H., Bogner, A., Austria's agri-biotechnology regulation: political consensus despite divergent concepts of precaution, in: *Science and Public Policy* 32(4), 277-28
- Tussenrapportage (2010), Commissie Maatschappelijke Dialoog Nanotechnologie, Tussenrapportage, maart 2009 – april 2010.
- UBA (2008), Beurteilung der Gesamtumweltexposition von Silberionen aus Biozid-Produkten, Umweltbundesamt, Forschungsbericht 360 04 020, UBA-FB 001212, Texte 43/08, ISSN: 1862-4804, under <http://www.umweltdaten.de/publikationen/fpdf-l/3673.pdf> (retrieved 28 February 2011).
- UBA (2009), Nanotechnik für Mensch und Umwelt – Chancen fördern und Risiken mindern, Presseinformation Nr. 75/2009, Umweltbundesamt, under <http://www.umweltbundesamt.de/uba-info-presse/2009/pdf/pd09->

- 075_nanotechnik_fuer_mensch_und_umwelt_chancen_foerdern_und_risiken_minder_n.pdf (retrieved 28 February 2011).
- UK Government (2005), Response to the Royal Society and Royal Academy of Engineering report: 'Nanoscience and nanotechnologies: opportunities and uncertainties. London: Department of Trade and Industry.
- UK Government (2010), UK Nanotechnologies Strategy: Small Technologies, Great Opportunities. London: Department for Business, Industry and Skills. <http://www.bis.gov.uk/assets/BISPartners/GoScience/Docs/U/10-825-uk-nanotechnologies-strategy>. Accessed on: 30/09/2011.
- UK Parliament (2000), GM FARM TRIALS. Post Note. London: The Parliamentary Office of Science and Technology. <http://www.parliament.uk/documents/post/pn146.pdf>.
- United Nations (2011), What is Good Governance?, Economic and Social Commission for Asia and the Pacific, download under: <http://www.unescap.org/pdd/prs/ProjectActivities/Ongoing/gg/governance.pdf> (last checked on 19. April 2011).
- Valve (2011), Valve, H., Qualified for evaluation? A GM potato and the orders of rural worth. Journal of Agricultural and Environmental Ethics DOI 10.1007/s10806-
- VCI (2010), Verband der Chemischen Industrie, Nanomaterialien – Vielfältige Eigenschaften und zahlreiche Anwendungen, 2010, under <http://www.vci.de/default2~rub~809~tma~0~cmd~shd~docnr~125659~nd~ond~nno.htm>. (retrieved 28 February 2011).
- Veggies Catering Campaign na., GM Oil in Nottingham Restaurants [Online]. <http://www.veggies.org.uk/page.php?ref=1130>. Accessed: 02/11/2011.
- Verbraucherzentrale Hamburg (2010), Immer mehr "Ohne Gentechnik" Produkte im Supermarkt, 20th December 2010, <http://www.vzhh.de/ernaehrung/30198/ohne-gentechnik-fehlanzeige-im-supermarkt.aspx> (retrieved 28 February 2011).
- Vidal (2010), Vidal, J., Academic resigns from UK food watchdog over 'GM propaganda'. The Guardian.
- VLOG (2010), Verband Lebensmittel ohne Gentechnik, Der Trend geht zu „Ohne Gentechnik“ – dynamische Entwicklung des VLOG, press release 23rd November 2010, under <http://www.ohnegentechnik.org/images/stories/pdf/pressemitteilung%20zur%20vlog%20mgv%202010.pdf> (retrieved 28 February 2011).
- Vogelezang-Stoute (2010), E.M. Vogelezang-Stoute, J.R. Popma, M.V.C. Aalders en J.M. Gaarhuis, Regulering van onzekere risico's van nanomaterialen. Mogelijkheden en knelpunten in de regelgeving op het gebied van milieu, consumentenbescherming en arbeidsomstandigheden, STEM-publicatie 2010/5 (in Dutch);English summary. (www.evaluatiemilieuwetgeving.nl)
- VWA (2008), Voedsel en Waren Autoriteit, Advies Bureau Risicobeoordeling, 'Nanodeeltjes in voedsel, 2008.
- VWA (2010), Voedsel en Warenautoriteit (Dutch Food and Consumer Product Safety authority), Nanodeeltjes in consumentenproducten, Factsheet ND09231G, 2010.
- Walker (2001), Walker, D. Some GM Crop Territory Conceded. Open i June 21.
- Wegrich (2009), Wegrich, Kai, Better Regulation?, Grundmerkmale moderner Regulierungspolitik im internationalen Vergleich, Bertelsmann Stiftung 2009, Download under: http://www.bertelsmann-stiftung.de/cps/rde/xbcr/SID-53127462-45998079/bst/xcms_bst_dms_27735_27736_2.pdf (last checked 25.04.2011).

- Welsh Government (2011), Genetically modified organisms [Online].
<http://wales.gov.uk/topics/environmentcountryside/farmingandcountry-side/plantsseedsbiotechnology/geneticallymodifiedorganisms/?lang=en>. Accessed: 20/11/2011.
- Werner Kniel Berg (2004), Die neue Gentechnik-Kennzeichnung und -Rückverfolgbarkeit – Sind diese Regelungen in der Praxis anwendbar?, Werner, A.; Kniel, B.; Berg, U., LMuR 1/2004.
- Which? (2006), Consultation response: Draft report of FSA regulatory review of the use of nanotechnologies in relation to food. <http://www.which.co.uk/documents/pdf/fsa-review-of-the-use-of-nanotechnologies-in-relation-to-food-which-response-176996.pdf>.
- Which? (2007a), Consumers unaware of nano-revolution [Online].
<http://www.which.co.uk/about-which/press/press-releases/campaign-press-releases/consumer-markets/2007/12/consumers-unaware-of-nano-revolution/>.
- Which? (2007b), Nanotech – small scale, big questions [Online].
<http://www.which.co.uk/about-which/press/press-releases/campaign-press-releases/consumer-markets/2007/09/nanotech--small-scale-big-questions/>.
- Which? (2008a), Research Highlights Nano Regulation Gaps [Online].
<http://www.which.co.uk/about-which/press/press-releases/campaign-press-releases/food-and-health/2008/05/research-highlights-nano-regulation-gaps/>.
- Which? (2008b), Small Wonder? Nanotechnology and cosmetics. BRIEFING.
<http://www.which.co.uk/documents/pdf/nanotechnology-and-cosmetics-161175.pdf>.
- Which? (2009a), House of Lords Science and Technology Committee: Nanotechnologies and Food Inquiry. <http://www.which.co.uk/documents/pdf/nanotechnologies-and-food-inquiry-which-response-180231.pdf>.
- Which? (2009b), Which? calls for greater transparency over nano-materials [Online].
<http://www.which.co.uk/about-which/press/press-releases/campaign-press-releases/consumer-markets/2009/07/which-calls-for-greater-transparency-over-nano-materials/>.
- Which? (2010a), Government ignores call for openness about nano food, says Which? [Online]. <http://www.which.co.uk/about-which/press/press-releases/campaign-press-releases/food-and-health/2010/03/government-ignores-call-for-openness-about-nano-food-says-which/#ixzz1aaDJiVu5>.
- Which? (2010b), Nano Food Briefing. <http://www.which.co.uk/documents/pdf/nano-food-which-briefing-196801.pdf>.
- Which? (2011), About Which? [Online]. <http://www.which.co.uk/about-which/>. Accessed: 04/10/2011.
- Wolinsky (2006), Wolinsky, H., Nanoregulation - A recent scare involving nanotech products reveals that the technology is not yet properly regulated. *Embo Reports*.
- Wright Head (2009), Wright, John S. F./Head, Brian, Reconsidering Regulation and Governance Theory: A Learning Approach. In: *Law & Policy*, Vol. 31, No. 2, 192-216.

LEGAL ACTS

Commission Regulation (EC) No 450/2009 of 29 May 2009 on active and intelligent materials and articles intended to come into contact with food Internet Sources.

Commission Regulation (EC) No 641/2004 of 6 April 2004 on detailed rules for the implementation of Regulation (EC) No 1829/2003 of the European Parliament and of the Council as regards the application for the authorisation of new genetically modified food and feed, the notification of existing products and adventitious or technically unavoidable presence of genetically modified material which has benefited from a favourable risk evaluation, OJ L 102, 7.4.2004, p. 14–25.

Commission Regulation (EU) No 10/2011 of 14 January 2011 on plastic materials and articles intended to come into contact with food.

Directive 2001/18/EC of the European Parliament and of the Council of 12 March 2001 on the deliberate release into the environment of genetically modified organisms and repealing Council Directive 90/220/EEC - Commission Declaration, OJ L 106, 17.4.2001, p. 1–39, consolidated version 2008-03-21.

Position of the European Parliament adopted at second reading on 19 January 2012 with a view to the adoption of Regulation (EU) No .../2012 of the European Parliament and of the Council concerning the making available on the market and use of biocidal products, P7_TC2-COD(2009)0076.

Regulation (EC) No 1049/2001 of the European Parliament and of the Council of 30 May 2001 regarding public access to European Parliament, Council and Commission documents

Regulation (EC) No 1169/2011 of the European Parliament and of the Council of 25 October 2011 on the provision of food information to consumers, amending Regulations (EC) No 1924/2006 and (EC) No 1925/2006 of the European Parliament and of the Council, and repealing Commission Directive 87/250/EEC, Council Directive 90/496/EEC, Commission Directive 1999/10/EC, Directive 2000/13/EC of the European Parliament and of the Council, Commission Directives 2002/67/EC and 2008/5/EC and Commission Regulation (EC) No 608/2004.

Regulation (EC) No 1223/2009 of the European Parliament and of the Council of 30 November 2009 on cosmetic products, OJ L 342, 22.12.2009, p. 59–209.

Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006, OJ L 353, 31.12.2008, p. 1–1355.

Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law,

establishing the European Food Safety Authority and laying down procedures in matters of food safety, OJ L 31, 1.2.2002, p. 1–24, consolidated version 2009-08-07.

Regulation (EC) No 1829/2003 of the European Parliament and of the Council of 22 September 2003 on genetically modified food and feed, OJ L 268, 18.10.2003, p. 1–23, consolidated version 2008-04-10.

Regulation (EC) No 1830/2003 of the European Parliament and of the Council of 22 September 2003 concerning the traceability and labelling of genetically modified organisms and the traceability of food and feed products produced from genetically modified organisms and amending Directive 2001/18/EC, OJ L 268, 18.10.2003, p. 24–28, consolidated version 2008-12-11.

Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, OJ L 396, 30.12.2006, p. 1–851, consolidated version 2009-06-27.

Regulation (EC) No 1935/2004 of the European Parliament and of the Council of 27 October 2004 on materials and articles intended to come into contact with food and repealing Directives 80/590/EEC and 89/109/EEC, OJ L 338, 13.11.2004, p. 4–17, consolidated version 2009-08-07.

APPENDIX I: Interview guidelines



UNIVERSITEIT VAN AMSTERDAM



1. GMO: General Questions

1. Can you briefly explain your role with regard to GMOs?

2. Which percentage of your weekly work time – or how many working hours per week – is related to ...?

- a. GMO in general | _____ | % or | _____ | hours per week
- b. GM food or feed | _____ | % or | _____ | hours per week

3. With which GMO-related products are you regularly concerned in your work at the stakeholder organisation?

4. What are your main concerns regarding GMOs or GMO-related products [from the stakeholders perspective as an organisation]?

5. a) Which GMO-related products in your view constitute the highest risk with regard to health? I will read the GMO-related products you mentioned. Please rank 3 of the mentioned product groups in the order of the highest risk. You can also add other products.

- 1. _____
- 2. _____
- 3. _____

b) Which GMO-related products in your view constitute the highest risk with regard to the environment? Again, I will read the GMO-related products you mentioned. Please rank 3 of the mentioned product groups in the order of the highest risk. You can also add other products.

1. _____
2. _____
3. _____

c) In your work at [name of the stakeholder organisation], are you concerned with GM-soy products in any of the products you mentioned? If yes, in which ones?

6. In your perception: Are there any risks related to GM-soy? If yes, which ones?
[interviewer: if necessary, clarify whether the respondent thinks about health and/or environmental risks]

7. Compared with GM-soy – are products with other GMOs more important for your work because of potential harms to health and/or the environment?

No

Yes

If, yes, which products do you have in mind

[interviewer: if necessary, clarify whether the respondent thinks about health and/or environmental risks]:

I am now reading to you a number of statements and I would like you to tell me whether you strongly agree, tend to agree, tend to disagree or strongly disagree with each of these statements.

Statements	Strongly agree	Tend to agree	Tend to disagree	Strongly disagree	Informed but not sure	No opinion
8. The rules presently in force concerning GM food product information via labelling are necessary to prevent potential harms to health and/or the environment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. The current EU and national regulation for GM food labelling are sufficient to prevent potential harms to health and the environment within the next years.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. In general, the current product information provisions enable consumers to make informed choices.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. In general, the current EU and national regulation for GM-labelling enables the consumers to make informed choices.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Most consumers are not interested in the information provided through GM food labelling.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Product labelling is generally trustworthy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. In general, it would be necessary to know more about consumer perceptions to support the regulatory process.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. The current everyday routines of consumers (e.g. when purchasing products) are sufficient to prevent harm from GMOs, to health and/or environment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. Do you think that there is a connection between harms to health and/or the environment and the consumer purchasing behaviour with regard to GM-soy products? Please explain your judgement.

No

Yes

Please explain your judgement.

2. National stakeholders point of view on European stakeholders

I would now like to talk about the role of European stakeholders.

Do you agree with the following statements?

17. In general, European stakeholders in your field give adequate consideration to national points of views of their national counterparts.

Strongly agree	Tend to agree	Tend do disagree	Strongly disagree	No opinion
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please explain your judgement:

18. National stakeholders like yourself have adequate opportunity to engage in participatory procedures at the European level.

Strongly agree	Tend to agree	Tend do disagree	Strongly disagree	No opinion
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please explain your judgement:

3. Labelling questions

I would now like to talk about GM labelling of consumer products.

19.

a) Do you agree with the following statement?

I am satisfied with the current GMO-labelling scheme.

Strongly agree	Tend to agree	Tend do disagree	Strongly disagree	No opinion
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please explain your judgement briefly

b)

If there is a national GMO-labelling scheme in place, do you agree with the statement?

I am satisfied with this scheme.

Strongly agree	Tend to agree	Tend do disagree	Strongly disagree	No opinion
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please explain your judgement briefly

20. In case you are not satisfied with the status quo of GMO-labelling. In what particular way would you like to modify it and why?

21. Do you know about any national GMO-labelling scheme which you would like to adopt in "your" national context?

No

Yes

Which : _____

22. What are the eventual advantages of this labelling scheme?

23. We have now come to the end of your questions. Are there any other important points with regard to GM-regulation that you would like to share?

24. Finally, since we are undertaking a comparison between GMO-regulation and nano-regulation. What do you think could be learned from nano?

25. In February 2011, we are going to hold a workshop with European stakeholders on better nano- and GM-regulation. Could you recommend a person of your European counterpart that might be interested to attend such a workshop?

FINISH



UNIVERSITEIT VAN AMSTERDAM



1. Nano: General Questions

1. Can you briefly explain your role with regard to nanotechnology?

2. Which percentage of your weekly work – or how many working hours per week – is related to the topic ...?

- a. Nanotechnology | _____ | % or | _____ | hours per week
- b. Nanomaterials | _____ | % or | _____ | hours per week
- c. Nanosilver | _____ | % or | _____ | hours per week

3. With which nano products are you regularly concerned in your work at the stakeholder organisation?

- a. Food packaging/Food
- b. Cosmetics:
- c. Textiles
- d. Biocides
- e. Pesticides
- f. Articles (e.g. washing machines...)
- g. Other products:

Can you please give me one example:

4. What are your main concerns regarding nanomaterials in these products [from the stakeholder perspective as an organisation]?

5.

a) In which of the following product groups do nanomaterials in your view constitute the highest risk with regard to human health or the environment? I will read the product groups to you. Please rank 3 of the mentioned product groups in the order of the highest risk.

Health

Food packaging/ Food

1: 2: 3:

Cosmetics

1: 2: 3:

Textiles

1: 2: 3:

Biocides

1: 2: 3:

Pesticides

1: 2: 3:

Non-consumable products (e.g. washing machines, packaging)

1: 2: 3:

Other products [interviewer: use any products mention in response to question 2]

1: 2: 3:

b) In which of the following product groups do nanomaterials in your view constitute the highest risk with regard to the environment? Again, I will read the product groups to you. Please rank 3 of the mentioned product groups in the order of the highest risk.

Environment

Food packaging/ Food

1: 2: 3:

Cosmetics

1: 2: 3:

Textiles

1: 2: 3:

Biocides

1: 2: 3:

Pesticides

1: 2: 3:

Articles (e.g. washing machines, packaging)

1: 2: 3:

Other products [interviewer: use any products mention in response to question 2]

1: 2: 3:

5c) In your work at [name of the stakeholder organisation], are you concerned with nano-silver products in any of the following product categories?

- a. Cosmetics:
- b. Textiles
- c. Biocides
- d. Pesticides
- e. Articles (e.g. washing machines...)
- f. Other products:

Can you please give me one example:

6. In your perception: Are there any risks related to nano-silver? If yes, which ones?
[interviewer: if necessary, clarify whether the respondent thinks about health and/or environmental risks]

7. Compared with nano-silver - are products with other nanomaterials (e.g. nano-SiO₂- or nano-TiO₂) more important for your work because of potential harms to health and/or the environment?

No

Yes

If, yes, which products do you have in mind

[interviewer: if necessary, clarify whether the respondent thinks about health and/or environmental risks]:

I am now reading to you a number of statements and I would like you to tell me whether you strongly agree, tend to agree, tend to disagree or strongly disagree with each of these statements.

Statements	Strongly agree	Tend to agree	Tend to disagree	Strongly disagree	Informed but not sure	No opinion
8. The rules presently in force concerning product information (e.g. via labelling, operating instructions) are sufficient to prevent potential harms to health and/or the environment from nano-silver.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. In general, the upcoming EU and national regulation for nano-labelling will be sufficient to prevent potential harms to health and the environment within the next years.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. In general, the current product information provisions enable consumers to make informed choices.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. In general, the upcoming EU and national regulation for nano-labelling will enable consumers to make informed choices within the next years.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Most consumers are not interested in the information provided through nano related product labelling.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. When handling nano-silver products (from purchase to disposal), consumers' compliance with product information is crucial to prevent potential harms to health and/or the environment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Product labelling is generally trustworthy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. In general, it would be necessary to know more about consumer perceptions to support the regulatory process.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. The current everyday routines of consumers (e.g. when purchasing, using or disposing products) are sufficient to prevent harm from nano-products to human health and/or the environment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

17. Do you think that there is a connection between harms to human health and/or the environment and the consumers' purchasing or handling behaviour with regard to nano-silver products?

No

Yes

Please explain your judgement.

2. National stakeholders point of view on European stakeholders

I would now like to talk about your perspective on European stakeholders.

Do you agree with the following statements?

18. In general, European stakeholders in your field give adequate consideration to points of views of their national counterparts.

Strongly agree	Tend to agree	Tend do disagree	Strongly disagree	No opinion
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please explain your judgement:

19. National stakeholders like yourself have adequate opportunity to engage in participatory procedures at the European level.

Strongly agree	Tend to agree	Tend do disagree	Strongly disagree	No opinion
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please explain your judgement:

3. Labelling questions

I would now like to talk about nano-labelling for consumer products.

20. Do you agree with the following statement:

I am satisfied with the status quo of nano-labelling in my country.

Strongly agree	Tend to agree	Tend do disagree	Strongly disagree	No opinion
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please explain your judgement briefly

21. In case you are not satisfied with the status quo of nano-labelling: What modifications would you like to see and why?

22. Do you know about any national nano-labelling which you would like to adopt in "your" national context?

No

Yes

Which :

23. What are the eventual advantages of this labelling scheme?

24. We have now come to the end of your questions. Are there any other important points with regard to nano-regulation that you would like to share?

25. Finally, since we are undertaking a comparison between nano-regulation and GMO-regulation. What do you think could be learned for nano from GMO?

26. In February 2011, we are going to hold a workshop with European stakeholders on better nano- and GM-regulation. Could you please recommend a person of your European counterpart that might be interested to attend such a workshop?

FINISH

APPENDIX II: Focus groups guidelines

SEBEROC

Focus group Guideline - GMOs

Section	Theme/Question	Guidance	Hints and further questions	Background of the theme
Introduction 10 Minutes (10)	Introduction by facilitator (see appendix) Self-Introduction of participants	Go-around	A warm-up question related to the topic or the products, e.g.: What is special about your favourite margarine?	Orientation and warm-up phase
Associated meanings 10 Minutes (20)	We would now like to talk with you about products related to genetically modified organism (GMO). A GMO is an organism whose genetic material has been altered using genetic engineering techniques. These techniques use DNA molecules from different sources, which are combined to create a new set of genes. This DNA is then transferred into an organism, giving it modified or novel genes. What comes to your mind if you think about GMO products?			Check for stimulus in comparable research
	And what comes to your mind if you think about GM soy?			
	And what comes to your mind if you think about GM soy margarine?			
Importance of product 3 Minutes (23)	Now we are interested what importance margarine have for your nutrition. For this purpose you find cards in front of you showing numbers between 0 and 10. 0 means: has absolutely no meaning for me. 10 means: has outstanding importance for me . 5 means: medium importance, and so on Please select that number which best represents the meaning that margarine have for your nutrition.	Let participant chooses card with value between 0–10; Ask to hold up card visibly to	Pay attention to what is said with regard to the following aspects: <ul style="list-style-type: none"> [to be specified] 	Create relationship between the product and participants' purchasing and nutrition behaviour; Current importance of the product and possible changes in response to the merge of a GMO version; Reports about own consumption behaviour as basis for assessment of answer on the following themes and of possible relationships.

	Would you like to show us your selected card?	all. Read out the results.		
Importance of criteria for purchase 3 Minutes (26)	What are the most important criteria for you if you buy margarine?		Follow-up question if necessary: <ul style="list-style-type: none"> • And what role does the production process play? 	Importance of product and process related criteria for purchase; Relevance of production process; Comparison with data from other sources. (relevance of criteria in general)
Knowledge about GMO margarine 5 Minutes (31)	You might have heard that there are margarines produced with GM soy on the market. Can you imagine that there is a difference between GM margarine and conventional margarine ? Please specify potential differences.	Note difference on wall paper; differentiate into product and process related criteria (two different columns).	Pay attention to differences with regard to: <ul style="list-style-type: none"> • Product qualities • Product safety • Price, • Labelling, • Trust, • Safety, • Availability, • Variety of offer, • additives, • methods of production, • environmental aspects of production • environmental aspects of use • waste issues. <p>Follow-up question if necessary Are you aware of any differences with regard to ... [points above]?</p> <p>Pay also attention to potential sources of information concerning the characteristics of nano.</p>	Associations and knowledge about GM margarine; Perception of differences between products and production processes
5 Minutes	What importance do the criteria that you have named for you if you buy margarine? A rather great importance or rather minor	Take recourse to the differences on the wall paper protocol	Follow-up question if necessary: <ul style="list-style-type: none"> • How important is it for you that margarine contains GMOs or no 	Partial utility of the different varieties on offer; Relevance and competitiveness of

(36)	importance?		GMOs?	GMO products in comparison to conventional products
Main arguments for buying a GMO product 5 Minutes (41)	If you imagine you are inside the head of your friend: What do you feel is their most important reason why they want to buy a GMO margarine?			Main motives for purchasing GMO product; unique selling point of GMO product
Main arguments for avoiding a GMO product 5 Minutes (46)	Now imagine you are inside the head of another of your friends who wants to avoid buying a GMO margarine. What do you feel is their most important reason why they want to avoid a GMO margarine?			Main motives for avoiding a GMO product; possible risk perceptions
GMO-labelling <u>Use GMO label</u> 5 Minutes	We are now distributing a margarine to each [pair of] you. Is there anything about this that catches your attention?	Distribute product with a "GMO free" label. Let participants time to inspect the product.	If necessary ,focus attention on the label.	Consumer handling, shopping related information behaviour
2 Minutes	Have you seen this label before?	Make sure that all respondents give a yes or no answer.		Knowledge about GMO free-labelling
5 Minutes	What do you think does this label tell you?		Look for: <ul style="list-style-type: none"> Confidence in interpreting a label Trust in the label Information: sufficient? Valued? What clues are participants looking for? How do participants explain what they see? Follow-up question on the above aspects if necessary.	Consumer competence; trust; knowledge; relevance
3 Minutes (61)	Would this label influence whether you buy a margarine?	Possibly value cards 0-10		

		Re-collect the product		
GMO product information on the packaging <u>Use GMO label2</u> 5 Minutes	We are now showing a picture of another margarine to each pair of you. Is there anything special/conspicuous about this product?	Distribute picture with product information "is produced with GM soy". Let participants time to inspect the product.	If necessary ,focus attention on the product information on the packaging.	Consumer handling, shopping related information behaviour
2 Minutes	Have you seen this kind of information before?			Knowledge about GMO-labelling
5 Minutes	What do you think does this information tell you?		Look for: <ul style="list-style-type: none"> • Confidence in interpreting a label • Trust in the label • Information: sufficient? Valued? Follow-up question on the above aspects if necessary.	Consumer competence; trust; knowledge; relevance
3 Minutes	Would this information influence whether you buy a margarine?			
(76)		Re-collect the product		
GMO information on a website <u>Use GMO Website</u> 5 Minutes	We are now distributing the print-out of the screenshot of a website. Please have a quick look at the print-out. What is your first impression of this website? Would you read the content of such a website? Would you follow the hint on a product package to such a website to find out more about the product?	Distribute print-out of the screenshot of the translated GMO-compass website. Ask question quickly after distributing.		Consumer handling, shopping related information behaviour
5 Minutes	Now take your time to look more carefully at the website. What do you think does the website tell	Let participants time to inspect the print-out.	Look for: <ul style="list-style-type: none"> • Confidence in interpreting a label • Trust in the label 	Consumer competence; trust; knowledge; relevance

	you?		<ul style="list-style-type: none"> Information: sufficient? Valued? Follow-up question on the above aspects if necessary.	
5 Minutes	How valuable do you think the information is to you?	ranking with cards 0-10		Barriers to accessing and understanding and using information
3 Minutes	Would you make an effort to visit such a website to assess about GM soy?	Value cards?		
2 Minutes	Would this information influence whether you buy GMO margarine?	Value cards?		
(96)		Re-collect the print out		
Responsibility for freedom of choice 8 Minutes (104)	<p>As you know, many groups and experts are trying to reach a better informed consumer through product information. Who do you think is responsible to assure that a consumer has enough information about products on the market?</p> <p>And who is most influential when it comes to assure information sufficiency about products on the market?</p>		Look for the following aspects: <ul style="list-style-type: none"> Role of the national state Role of the EU Role of producers Role of retailers Role of consumers Role of foreign competitors exporting products to the EU. If necessary, bring in the options set out above.	Perceived influence of various actors on freedom of choice.
Responsibility for negative impacts 8 Minutes (112)	<p>Another much debated issue are the negative impacts of consumer products. Who do you think should be responsible for minimizing the negative impacts from consumer products?</p> <p>Some argue that consumers should play a greater role in improving the environmental performance of consumer products, their production and disposal. Do you agree with this opinion?</p>			Perceived influence of various actors on negative impacts

<p>Final Go-around 8 Minutes (120)</p>	<p>Finally we would like to know whether you have enjoyed this discussion. Here our number cards will be helpful again. If a ten means that you enjoyed this discussion very much, and a zero that you did not like it at all, which card are you showing us?</p>	<p>Let participants choose card with value between 0-10; ask them so show card visibly.</p>	<p>If time: What did you like here and today in particular, and what did you dislike?</p>	
<p>N. Organisational finish</p>	<p>Thanks and Good-buy Point out to participants the a member of the team will go around and hand over the participation reward</p>			

SEBEROC

Focus group Guideline - Nano

Section	Theme/Question	Guidance	Hints and further questions	Background of the theme
Introduction 10 Minutes (10)	Introduction by facilitator (see appendix) Self-Introduction of participants	Go-around	a warm-up question related to the topic or the products, e.g.: How does your favourite chopping board in your kitchen look like?	Orientation and warm-up phase
Associated meanings 10 Minutes (20)	We would now like to talk with you about nano products. These are products which have been produced with nanotechnology that operates at a scale below 1/1000 mm, or products that contain particles that are smaller than 1/1000 mm. 1 nanometre is one millionth of a millimetre. What comes to your mind if you think about nano products?			Check for stimulus in comparable research
	And what comes to your mind if you think about nano-silver?			
	And what comes to your mind if you think about nano-silver chopping boards?			
Importance of product 3 Minutes (23)	Now we are interested what importance chopping boards have in preparing food in your kitchen. For this purpose you find cards in front of you showing numbers between 0 and 10. 0 means: has absolutely no meaning for me. 10 means: has outstanding importance for me . 5 means: medium importance, and so on Please select that number which best represents the meaning that chopping boards have in preparing food in your kitchen. Would you like to show us your selected	Let participant chooses card with value between 0–10; Ask to hold up card visibly to all. Read out the results.	Pay attention to what is said with regard to the following aspects: <ul style="list-style-type: none"> [to be specified] 	Create relationship between the product and participants' purchasing and kitchen behaviour; Current importance of the product and possible changes in response to the emergence of a nano version; Reports about own consumption behaviour as basis for assessment of answer on the following themes and of possible relationships.

	card?			
Importance of criteria for purchase 3 Minutes (26)	What are the most important criteria for you if you buy a chopping board?		Follow-up question if necessary: <ul style="list-style-type: none"> • And what role does the production process play? 	Importance of product and process related criteria for purchase; Relevance of production process; Comparison with data from other sources. (relevance of criteria in general)
Knowledge about nano chopping boards 5 Minutes (31)	You might have heard that there are nano-silver-coated chopping boards on the market. Can you imagine that there is a difference between a nano chopping board margarine and a conventional chopping board ? Please specify potential differences. If there is no feedback: Explain what nano-silver is and does: "it is a coating which you cannot see and gives the chopping board an anti-bacterial effect"	Note differences on wall paper; differentiate into product and process related criteria (two different columns).	Pay attention to differences with regard to: <ul style="list-style-type: none"> • Product qualities • Product safety • Price, • Labelling, • Trust, • Safety, • Availability, • Variety of offer, • additives, • methods of production, • environmental aspects of production • environmental aspects of use • waste issues. Follow-up question if necessary: Are you aware of any differences with regard to ... [points above]? Pay also attention to potential sources of information concerning the characteristics of GMO.	Associations and knowledge about nano chopping boards; Perception of differences between products and production processes
5 Minutes	What importance do the criteria that you have named have for you if you buy chopping boards? A rather great importance or rather minor importance?	Take recourse to the differences on the wall paper protocol.	Follow-up question if necessary: <ul style="list-style-type: none"> • How important is it for you that chopping boards contain nano or no nano materials? 	Partial utility of the different varieties on offer; Relevance and competitiveness of nano products in comparison to con-

(36)				ventional products
Main arguments for buying a nano product 5 Minutes (41)	If you imagine you are inside the head of your friend: What do you feel is their most important reason why they want to buy a nano chopping board?			Main motives for purchasing nano product; unique selling point of nano product
Main arguments for avoiding a nano product 5 Minutes (46)	Now imagine you are inside the head of another of your friends who wants to avoid buying a nano chopping board. What do you feel is their most important reason why they want to avoid a nano chopping board?			Main motives for avoiding a nano product; possible risk perceptions
Nano-labelling <u>Use Nano label1</u> 5 Minutes	We are now distributing a chopping board to each [pair of] you. Is there anything about this that catches your attention?	Distribute product with a nano label no. 1. Let participants time to inspect the product.	If necessary ,focus attention on the label.	Consumer handling, shopping related information behaviour
2 Minutes	Have you seen this label or a similar nano label before?	Make sure that all respondents give a yes or no answer.		Knowledge about nano-labelling
5 Minutes	What do you think does this label tell you?		Look for: <ul style="list-style-type: none"> Confidence in interpreting a label Trust in the label Information: sufficient? Valued? What clues are participants looking for? How do participants explain what they see? Follow-up question on the above aspects if necessary.	Consumer competence; trust; knowledge; relevance
3 Minutes	Would this label influence whether you	Possibly value cards 0-10		

(61)	buy a chopping board?			
		Re-collect the product		
Nano product information on the packaging <u>Use Nano label2</u> 5 Minutes	We are now showing a picture of another chopping board to each pair of you. Is there anything special/conspicuous about this product?	Distribute picture with product information "is produced with nanosilver". Let participants time to inspect the product.	If necessary ,focus attention on the product information on the packaging.	Consumer handling, shopping related information behaviour
2 Minutes	Have you seen this or a comparable kind of nano information before?			Knowledge about nano-labelling
5 Minutes	What do you think does this information tell you?		Look for: <ul style="list-style-type: none"> • Confidence in interpreting a label • Trust in the label • Information: sufficient? Valued? Follow-up question on the above aspects if necessary.	Consumer competence; trust; knowledge; relevance
3 Minutes	Would this information influence whether you buy a chopping board?			
(76)		Re-collect the print out		
Nano information on a website <u>Use Nano website</u> 5 Minutes	We are now distributing the print-out of the screenshot of a website. Please have a quick look at the print-out. What is your first impression of this website? Would you read the content of such a website? Would you follow the hint on a product package to such a website to find out more about the product?	Distribute print-out of the screenshot of the website. Ask question quickly after distributing.		Consumer handling, shopping related information behaviour
5 Minutes	Now take your time to look more carefully at the website.	Let participants time to inspect the print-out.	Look for: <ul style="list-style-type: none"> • Confidence in interpreting a label 	Consumer competence; trust; knowledge; relevance

	What do you think does the website tell you?		<ul style="list-style-type: none"> Trust in the label Information: sufficient? Valued? Follow-up question on the above aspects if necessary.	
5 Minutes	How valuable do you think the information is to you?	ranking with cards 0-10		Barriers to accessing and understanding and using information
3 Minutes	Would you make an effort to visit such a website to assess about nano chopping boards?	Value cards?		
2 Minutes	Would this information influence whether you buy a nano chopping board?	Value cards?		
(96)		Re-collect the print out		
Responsibility for freedom of choice 8 Minutes (104)	<p>As you know, many groups and experts are trying to reach a better informed consumer through product information.</p> <p>Who do you think is responsible to assure that a consumer has enough information about products on the market?</p>		Look for the following aspects: <ul style="list-style-type: none"> Role of the national state Role of the EU Role of producers Role of retailers Role of consumers Role of foreign competitors exporting product to the EU. If necessary, bring in the options set out above.	Perceived influence of various actors on consumer safety
	And who is most influential when it comes to assure information sufficiency about products on the market?			
Responsibility for environmental impacts 8 Minutes	<p>Another much debated issue are the environmental impacts of consumer products.</p> <p>Who do you think should be responsible for minimizing the environmental impacts form consumer products?</p>			Perceived influence of various actors on environmental impacts

(112)	<p>Some argue that consumers should play a greater role in improving the environmental performance of consumer products, their production and disposal.</p> <p>Do you agree with this opinion?</p>			
Final Go-around 8 Minutes (120)	<p>Finally we would like to know whether you have enjoyed this discussion. Here our number cards will be helpful again. If a ten means that you enjoyed this discussion very much, and a zero that you did not like it at all, which card are you showing us?</p>	<p>Let participants choose card with value between 0-10; ask them so show card visibly.</p>	<p>If time: What did you like here and today in particular, and what did you dislike?</p>	
N. Organisational finish	<p>Thanks and Good-buy</p> <p>Point out to participants the a member of the team will go around and hand over the participation reward</p>			