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POLICY CHANGE: THE CHESS OF RATIO

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Decision-making:
Once a process of the kings and their experts;
A process made by people and their beliefs;
And still:
A process of ratio and power;
Entangled within philosophical, psychological, and cultural implications.

This research examines political change within the European domain on genetically engineered organisms through the lens of Sabatier's Advocacy Coalition Framework (ACF) and Haas' Epistemic Community (EC). The question about actors and policy change within the last three, almost four decades revolves around a dispute of contradicting beliefs (utopian and dystopian) that impacts the understanding of GMOs and the development of suitable policy strategies to assess and manage potential risks and benefits. A post-hoc hypothesis testing is used in order to analyse change within the development of this policy domain. The main focus is on the various actor groups, their beliefs and their impact on policy change. This study confirms that the actual dominance of actors in this policy domain and their ability or drive to lobby for their belief are important aspects when considering policy change. It is the dominance of certain beliefs over others within the institutional structures and involved governmental bodies that enables or limits policy change. Other significant findings are 1) that disputing beliefs did not change while actors' constellations within advocacy coalitions did, 2) that dependencies between science and economic criteria and values increased, and 3) that technological advances have increased the role of other players limiting the autarchy of scientists. In extension the concept of Haas on the EC can improve a theoretical framework especially in disputes involving high uncertainties. In conclusion, this research determines that the ACF and the EC present suitable tools to analyse policy change in the GMO policy domain.

Keywords: Advocacy Coalitions, Epistemic Community, GMO, policy change, belief, uncertainties

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CHAPTER 1: INTRODUCTION

"*Non!*: France Bans Monsanto's Genetically Modified Corn". "Bill Gates: We Need Genetically Modified Seeds". "Fears grow as study shows genetically modified crops *can cause liver and kidney damage*". "Spain a key ally of pro-GMO America, cables reveal". Simply searching Google using the words 'gmo' and 'headline' gives one over a million hits with screaming headlines that reveal the GMO policy domain is a contested one. When one delves further into the area of Genetically Modified Organisms one discovers first of all that Genetically Modified Organisms (GMOs) or Genetically Engineered Organisms (GEOs) involve an 'intentional change of the genetic make-up of plants or animals by changing the code of a gene (adding, adjusting or removing one or more of the thousands of genes that control the characteristics of the plant or animal') (X.Gonzalez, 2009:11). This opens up a totally new area for science and its practical application.

The practice holds the capacity to actually alter certain qualities within an organism. Therefore GMOs can play a major part in tackling food shortages and adapt to changing climate conditions. Opponents point to concerns regarding the actual impacts of GMOs on socio-economic factors, humans, animals and existing ecosystems, because of uncertainties that accompany any new technology. It becomes apparent that opinions about how to look at this technology are divided. Digging yet a bit deeper, one finds that from the very inception, and even from the very beginning of biotechnology itself in 1974, opinions about it have been divided.

Beliefs about the potential benefits and unknown risks of this technology are in dispute. Actors present evidence *against* and *for* research into GMOs and its practical application. Also scientists are divided in their beliefs regarding suitable methods and practices, and what's more, they differ in their perception of the technology itself. The uncertainty involved with research on biotechnology brings up doubts about safety issues. Especially with regard to the release of GMOs into the environment, the lack of a total understanding of living organisms in their complexities, involving all their compounds, raises several questions about the actual safety of this practice. Furthermore, the danger of a mistake and the impact of such are seen as potentially devastating. A possible mistake and/or unknown and undesirable side affect occurring after the release could not be countermand or reversed. Technological development also raises ethical questions regarding the purpose and usage of scientific developments. By

now experts but also the general public have enough experiences with technological developments and the related negative effects, so that they ask about not only the practicality, but also the externalities or possible negative effects on health and the environment. Therefore, though the development of this technology is a highly scientific policy issue, it cannot be treated as merely a technical matter.

In general biotechnology and GMOs in particular, could be part of our future development. It could improve living conditions for many people, but carries within it uncertainty and the risk of also deteriorating living conditions. As Bandelow points out, there is no consent on how to use possible benefits or on how to determine and/or manage possible risks (Bandelow, 2006:749). The practice is both, applauded and protested because it has many implications on a variety of levels. Controversies generally are centred on human safety, environmental safety and conservation, ethical issues, food security, intellectual property rights, consumer choice, innovation and societal development.

A dispute surrounding the 'eligible' management of such risks within this policy domain exists for almost four decades since the very inception of the GMO technology and policy domain. A dispute exists when different interests, beliefs or opinions collide with one another. The beliefs impact actors' understanding of information and their perception thereof. Institutionalized criteria and resource structures further impact the establishment, formulation and use of information. What is accepted as suitable knowledge and reasoning within existing structures can change. In the dispute over GMOs actors involved within the policy domain disagree on the 'correct' view on specific issues and present different solutions to 'tackle' biotechnology and their risks in Europe. When policy creation runs into such a situation (where opinions, interests and beliefs collide) there is no clear direction that can be taken.

Actors lobby for their interests and beliefs to be included within decision-making structures and outcomes. These interests and beliefs are closely linked to opinions which however do not change so easily. So in order for there to be some major policy change beliefs about biotechnology have to change, or actors have to find common ground or actors will be 'dominated' by other actors. *The Advocacy Coalition Framework* (ACF) of Sabatier offers a suitable framework to analyze policy change. Instead of focusing on the structural and

institutional set-up the ACF exactly considers the role of knowledge, beliefs and values (Sabatier and Jenkins-Smith 1999:243). It connects people and their beliefs to impact policy change, stressing the importance of differing beliefs within the development of a dispute aligned to policy program(s).

An actor within the policy domain who beliefs in a certain basic principle will be more likely to perceive certain suitable methods, benefits and costs, and safety related aspects, than one who bases his/her understanding on a different belief. To give an example, an actor whose basic vision underlines a utopian belief is more likely to feel that products produced through genetic engineering are the 'same' as conventional organisms . Possible benefits (and profits) are perceived as being large or significant and stringent risk assessments and safety requirements are 'felt' as unnecessary burdens (and costs). Contrarily, there are actors of the advocacy coalition with a dystopian belief or frame towards GMOs. They point to taking the necessary precautions, warn about risks and call for increased regulation and control. Generally, they present health, environmental, socio-economic and safety interests.

The prioritization of arguments among camps is different because they incorporate different concerns and use different methods and frames to evaluate disputes and to define the problem at hand and 'solve' disputes. Diverging actors have diverging beliefs and thus a change of actors as pointed out by Sabatier and many more scholars can lead to a change in dominant framing of disputes.

Another aspect to consider is that the actors involved can be categorized in various ways. Actor groups come together in, as Sabatier calls them, advocacy coalitions to lobby for their beliefs and interest. These groups change in their organization and constellation over time. Sabatier points to specific actor groups which will be included in this research. I will look at their basic group membership (Industry, agricultural sector, social and environmental organizations, etc.). Each group of these actors bring different beliefs, knowledge and ethics to the table. Besides the numbers of involved actors and their resources also the balance of involved beliefs within the policy domain should be included when analyzing policy change. The ACF provides with hypotheses which can help in crystallizing the aspects one wants to study to analyse the GMO policy domain.

The ACF and its hypotheses are used as input for a post hoc hypothesis testing. This is a testing of an event or experiment which happened in the past and which is looked-up on from the

perspectives given by a theory and applicable hypothesis. The GMO policy domain and its development is the 'experiment', the research looks at specific aspects (variable and indicators) to draw conclusions referring to the hypotheses. Because the event under observation presents a timeline and the interest is on occurring changes therein, one needs to also consider comparison models. One of the biggest problems is to choose specific aspects for comparison. The more aspects one looks at the more likely it is to find differences within comparisons. The less one looks at the less one can generalize. A balance is important, so one has to look at a variety of aspects that seem to affect certain changes. The framework it-self does not give a blue-print for how to use and limit indicators and test them in their relevance, considering for example p-values in a statistical analysis. Therefore it is important to restrict deduction and possible induction to comparing some aspects (variables) rather than all. The application is especially to learn more about the dispute surrounding GMOs including considerations of special actor groups and general beliefs of ACs. Three of Sabatier's nine hypotheses will be considered in this research (see Table 1: Sabatier's Hypotheses, p.16) (Sabatier, 1998:106). Sabatier's first hypothesis considers coalitions, the forth and fifth hypotheses refer to policy change. The development of the dispute will be seen as the event and will be analyzed according to variables and their indicators derived from the particular hypothesis.

Policy change is affected by many aspects. A dispute mostly arises between certain actors. Because of the highly technical nature of GMOs and the large role that scientists play not only in the development of GMOs but also as input in the decision-making process, these actors are important to consider when analysing the development of the dispute. Therefore this paper considers also the concept of the Epistemic Community introduced by Haas. The EC focuses on scientists as strong actors in especially technical and scientific concerned policies. As major player they create measures and targets, and determine strategies for political problems. The epistemic community (EC) is part of the scientific community directly influencing policy-making with their beliefs, methods and rationalization. With the power over knowledge the EC dominates the framing of the problem and suitable solutions at hand. Therefore this paper combines this concept into the explorative research on policy change. The focus is however put on the broader concept of advocacy coalitions involving also various other actors.

This research explores policy change concerning the dispute surrounding biotechnology specifically GMOs by focusing on advocacy coalitions, their constellations, and beliefs. The main research question is:

> *'To what extent can relations be discerned between (changes in)* policies *and (changes in)* beliefs *in the European GMO policy domain from 1974 till the present day viewed through the lens of the Advocacy Coalition Framework?'*

In order to answer this question certain sub-questions need to be posed. First of all, it is necessary to look at the development of related policies. The first sub-question is:

> *'How have the policies in the EU evolved within the GMO policy domain?'*

Different time periods will be crystallized by choosing time periods according to main characteristics which are pointed out in the Chapter 'History'**.** Five time periods will be distinguished and presented. Insight gathered from other research is linked to external and internal events which are understood as sources (indirect and direct) impacting policy change and the political sub-system of GMOs in Europe.

Secondly, one needs to determine which actors have been relevant players in the GMO sub-domain and if these actors can be grouped in differing coalitions according the AC framework. Furthermore, it is significant to determine what beliefs these actors have had and advocated, because according to the ACF actors with similar beliefs can be grouped within a coalition that then advocates a 'shared' or common belief. The next sub-question therefore is:

> *'Which actors can be discerned in the GMO policy domain, what are their beliefs and how have these evolved, and to what (if any) coalitions can these actors be assigned?'*

By comparing the different main aspects, (beliefs and actors of advocacy coalitions, policy core attributes and external perturbations) which are collected for each time period one can analyze some relations between possibly occurring changes of actors, beliefs and policies. In the end of the paper a table presents each time period with some of the main characteristics, crystallized

events, main actors and their coalitions' common belief (see Appendix: Time Period Tables 1-6). In order to answer the main research question and the sub-questions several hypotheses from the AC framework will be taken into consideration, and tested for the GMO policy domain. These hypotheses will be presented in the Chapter 'Framework'.

In order to collect sufficient data on the development of the dispute lots of literature, peer-reviewed journals, but also press articles, governmental action plans, party programs and even official statements (values, purpose and/or cause) on websites of actors are included in analysis. Position papers, conferences and (panel) discussions are also involved, because statements can present evidence on the hierarchy of beliefs of involved actors and their affiliation to specific coalitions (see Table 1: Hypotheses 2 and 3, p.16). The more often they are made the more important they are for an actor group or even the whole advocacy coalition. It is also interesting to see how often certain actors are mentioned within press articles and/or referred to in order to ascertain their impact or relevance in the policy domain.

Both, primary literature (research, agreements directive governmental program applied methods, standards) and secondary literature (journals, newspaper articles, documentaries, and books) are considered. This will present evidence on relevant actors and their belief structures within the domain of genetically engineered organisms and their release into the environment in Europe (Table 2, p.22-23). Data is collected and sorted according to specific aspects as given by theory. Memos were written for example on involving more aspects during the next interview because of a new discovered relevant issue. The model for methods used had to grow with the collection of new information. Glaser and Strauss ideas on hypothesis testing and method creation during data collection were considered (Glaser&Strauss, 1967). Elemental coding was used besides building method by producing an integrating memo, creating order out of chaos (Lofland(s), 1995). Lots of material can however, not be clearly evaluated. It is thus important to limit the aspects one considers, and can consider. Conclusive statements have to be formulated with regard to possible mistakes in interpretations of given statements.

Information found has to be viewed through an observing, objective and neutral lens. Information given has to be seen in the light of advocacy coalitions. This limits naive claims about who is right or wrong within the dispute but rather focuses on the actual aspects which lead this conflict to stay alive even though policies and the whole political domain evolve(s). Throughout the public and the scientific world, in governmental papers, press and university

articles information is twofold, either praising or condemning GMOs. There are those who present information only about potential benefits and those who only confirm risk perceptions. Information and knowledge about GMOs thus is divided in information by those who consider negative effects closely and those who consider possibilities instead. Nevertheless, exactly this division in focus on different parts of knowledge and information can tell us about the importance of the beliefs in dispute. They influence the use and the understanding of gathered information. People are more likely to perceive information confirming their own beliefs rather than information speaking against such (perceptual filtering).

Considering these aspects when looking at history and all these statements of actors today gives insight into certain beliefs and linkages to specific opinions and strategies of involved (opposing) actors. The actual participating actors (conferences, panel discussion, etc), the tone used during a speech, the jokes made, and even the 'purpose' of the event itself are aspects that have to be considered, when trying to make sense of involved opinions and actors.

CHAPTER 2: THEORY AND METHODS

1.1 Background

Philosophers like Machiavelli and Nietzsche link power to using knowledge in practice in their work. Power in practice can steer reasoning towards rationalisation, form the rules, and the rational surrounding an event and/or problem. In order to understand political changes one thus has to consider also the question pointed out by Flyvbjerg (referring to a Nietzsche 'like' question): "What 'governmental rationalities' are at work when those who govern govern?" (Flyvbjerg, 1998:6). Rational, power and culture in this understanding are not separated issues, they re-shape one another in a constant intertwined development of societies, policies and institutions. The beliefs we have impact our perception on reality and knowledge, the dependencies and resources we perceive impact our acting and decision-making. While again the institutions we build impact our behaviour and reasoning (scope).

As Douglass North said in his Nobel Prize Speech: "The organizations that come into existence will reflect the opportunities provided by the institutional matrix. That is, if the institutional framework rewards piracy then piratical organizations will come into existence; and if the institutional framework rewards productive activities then organizations –firms- will come into existence to engage in productive activities.". In other words, there is a link between institutionalized rationality/truth steering the methods and processes which affect the behaviour of individuals. For inducing change to implemented methods and processes this institutionalized rationality provides with a kind of leading base, the 'norms of behaviour' as Ostrom puts it "Norms of behavior […] affect the way alternatives are perceived and weighed" therefore also in policy-making "[…] searching for better solutions is constrained and guided by norms of behavior." (Sabatier, 1999:241).

Rational choice making is limited in that in reality the ideals necessary are not met. Time, information and other resources are limited. It is thus impossible to consider all evidence and all possibilities under limited time and scope. This is where the concept of bounded rationality comes in. Bounded rationality admits that there are limits to rational choice. The Advocacy coalition framework used in this study focuses on beliefs impacting rational choices.

1.2 Risk Frames

One of the major aspects within the policy arena concerning biotechnology are the risks of GMOs and with regard to them, policy-making and risk management. In general there are different understandings to what constitutes risks. Risks are understood as the potential of occurring hazards. Hazards are possible negative effects which could occur during an action while each action poses its potential risk(s). The actual posed risks can vary according to given circumstances.

With regard to biotechnology the involved risks can be categorized into areas which they might affect, like for example medical, environmental, geopolitical, socio-economic & cultural. One can also categorize risk into 'directly observable', 'scientific observable' and 'virtual' risks. Biotechnology involves high levels of uncertainties and still is lacking in general conclusive scientific evidence and therefore involved risks are 'virtual' risks. Virtual risks present issues which include uncertainties and therefore risk levels and risks are determined based on (proxy-based) assumptions to reach estimations. Within this category of risks the individual's 'experience' of what constitutes 'risk' impacts the development of policies and risk management strategies. The involved uncertainties moreover impact the consent levels of experts and epistemic community/-ies. Risks are more likely to be interpreted differently and suitable management methods are disputed by different risk frames. Actors build their understanding on their basic interpretations of reality and their interests (Burchell, 1998; Adams, 2002).

We all use filters to perceive reality and deal with involved uncertainties. Filters help us to understand and order our environment into comprehensive categories. The actors' filter to perceive and cope with reality and its uncertainties are thus of special importance to the understanding of virtual risk management (Thompson et al., 1990).

The different perceptions on safety, benefits and possible risks give insight into the risk framing of actors. Theory links basic principles of dealing with uncertainties and risks to different myths of nature and/or identities in cultural theory. Thompson associated myths of natures with specific rationales and/or perceptual frames which again link to specific management strategies for coping with risks. In this regard a precautionary principle is linked to a precautionary stand towards perceiving and treating uncertainties and risks. There are four 'myths of nature' which direct various perceptions about the world and are understood to 'guide decisions made in the face of uncertainties'. In the end the paper presents a table (Time Period Table 6, p.61-63) and I

will try to link management principles to myth of nature to time periods. With regard to this actors can relate to 1) Nature benign, 2) Nature ephemeral, 3) Nature perverse/tolerant or 4) Nature capricious (Appendix: Time Period Table 6, p.63). Sadly, this is too complex to also be involved in detail within this study, aspects should however be viewed up on in a possible follow up research.

Using the implications presented within this chapter is nevertheless important for this research. It becomes apparent that filters impact our understanding of information and even our opinion building and actual learning. Cultural and normative aspects influence the perceptions of actors (including scientists) and become more important in steering beliefs and therefore decision-making when 'cognitive' aspects involve high uncertainties. Here, "Cognitive approaches that focus solely on (scientific) knowledge and interests while ignoring the normative dimension are insufficient." (Abels, G., 2002:4).

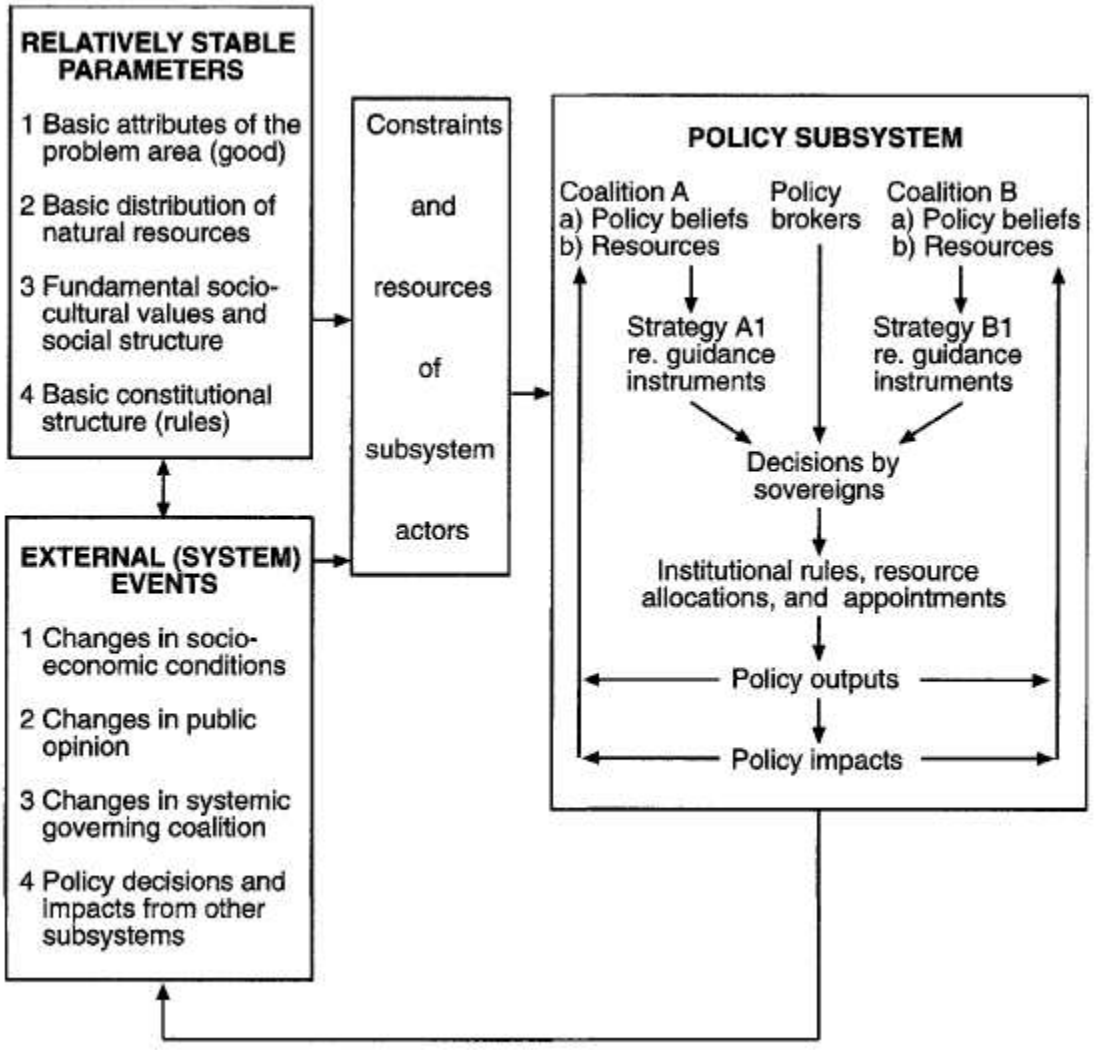
1.3 Framework and Method

The ACF was developed by Paul A. Sabatier in 1988. In 1993 he revised the framework in cooperation with Hank Jenkins-Smith (cf. Sabatier and Jenkins-Smith, 1993). Sabatier and Jenkins-Smith sketch the most relevant aspects impacting the creation of policy and policy change. The core of the framework focuses on the role of advocacy coalitions and their beliefs as part of policy change and/or policy learning within a specific policy domain, henceforth called a political sub-system. The revisions of the framework mainly refer to *an increased importance of external perturbations besides learning among and within coalitions as preconditions to major policy change.*

Different political domains are called political sub-systems within which specific policy problems are strategically influenced and decided upon. A political sub-system is made up by the regulations and institutional set-up referring to the policy domain, the actors of the involved advocacy coalitions and policy brokers. Actors (with an interest and willingness to engage) are seen to enhance their strength in influencing politics (power) by forming so called advocacy coalitions (AC). Actors of one AC share some common beliefs setting them apart from other AC's. In order to influence policy outcome they develop strategies which they promote to the

'policy broker', who in turn impacts politicians and political outcomes. The coalitions as described by Sabatier, involve various actors from various fields, professions, sectors and levels (from media, NGOs, the Industry to scientists and more) (Sabatier, 1998:99). The following figure (Figure 1) can aid to visualize and comprehend this framework better.

Figure 1: ACF
(Sabatier's Revised Figure of the ACF)



Source: Sabatier, 1998:102

There are different types of change. Policy change is mostly divided into major and minor change. The concepts of each, however, stay rather vague and to differentiate between them can hold room for errors. In the ACF major policy change is understood to impact the core of a policy program. Minor policy change is seen to be of a rather strategic nature changing some aspects of the policy sub-system, some strategy or tool, however, not the policy core. In this aspect the ACF does not present a very clear conceptualization. With regards to a historical view on developments of societies and political systems one needs to often connect various little aspects or minor changes and events to explore the actual change. The ability to pin point down when exactly change happens, stays always limited to some extent. Hence, also temporary changes, which are most often minor changes, need to be taken into consideration. For example Sabatier would most likely disagree with this because he points to an external perturbation being necessary to be cause for the change of the policy core. However, he does agree in his revised hypothesis version that it is not sufficient in it-self (Revised version of hypothesis 5, Sabatier, 1998:118).

The framework uses a hierarchical belief model to underline the importance of the inner world of actors influencing policy change and forming disputes. In Sabatier's view policy change can however, also be caused by external system-wide changes. These include actors' and institutional changes also referring to other cross-related political sub-systems or sub-sub-systems impacting internal changes (personnel and resources) like the compositions of actors influencing policy outcome and/or their resources.

With regards to the beliefs of actors information is viewed as the most important resource able to steer towards learning and change beliefs. New information and/or experiences therefore present sources for policy change. Either by impacting learning and thus changing existing beliefs of actors or impacting changes to strategies of advocacy coalitions (Sabatier, 1999:243&252).

As we see policy change can be impacted by various aspects, such as non-cognitive sources made of external or internal change. External change can be connected to policy unrelated issues impacting system dynamics, like an economic crisis or a war which can impact and steer the policy program. Internal events can be related to a change of institutions, actors and their positions within the sub-system and/or a change of their dominance and/or power in impacting the policy broker. Compositions of actors and resources can be altered leading to a change of

public policy within the sub-system. Changes to actors and involved personnel within the sub-system caused by external and/or internal events can also be seen as non-cognitive sources to change, (e.g. death, retirement) influencing the *policy resources and decisions* (Sabatier, 1999:123).

The experience of new information can be understood differently. Similarly also external and internal events can be perceived differently. They can be understood as important, or irrelevant, they can stimulate learning or they can be a strategic tool to support own goals (Bandelow, 2006:787). Possible limitations to actions due to a change of resources can influence actors' awareness of possible and accessible actions and behaviour possibilities within the sub-system. The realization of the actual changes to an actors' power within the sub-system can vary among individuals. They might experience limitations as ultimately hindering and feel less motivation and empowerment to act. However, they can also see them as minor limitations which can be changed, stimulating them to engage and create change towards 'own' goals.[1]

Both, information and experiences are perceived from the 'lenses' of actors (e.g. educational, cultural, theoretical, value-loden). Actors are more reluctant to perceive information against their own beliefs compared to information which supports their perceptions, policy beliefs, goals and strategies. Bandelow confirms this by saying that the consideration and stimulus to learning depends on the perception of the actor on new information both external and internal event and/or information. The given circumstances to stimulate learning among and across coalitions furthermore impact the chances for learning (Bandelow, 2006:787). Learning is a difficult concept which is not easy to conceptualize. A change of beliefs and perceptions stimulated by the means of new information (or its prioritization) can be seen to refer to a possible result of learning. One could say that: "Learning is a process of drawing connections between what is already known or understood and new information." (Darling-Hammond et al., 2001:11). Plato, Aristotle, Socrates and Thorndike laid down the bases for this concept in their search for establishing the 'truth'. Their work paved the way for the stimulus-response learning theory of modern behaviourism by Skinner. Jean-Piaget was the one to point towards the cognitive process in which he sees the experiences of the individual as impacting the receiving of knowledge and thus also the process of creating knowledge (learning) (Darling-Hammond et al., 2001:2, 5&6).

[1] This is reflected in for example a response I got during an open discussion (NABU: BT-Maisanbau in Brandenburg, on 21 June 2011 in Berlin.) See Appendix Endnotes.

Besides finding out more about the policy domain of GMOs this research is also interesting because it allows us to test some of Sabatier's and Jenkins-Smith's hypotheses (Sabatier, 1999:124). The following table presents a short over-view of all hypotheses and a short note towards their relevance for this study (Table 1).

Table 1: Sabatier's Hypotheses[2]

Hypotheses Nr.	Hypotheses	Relevance for this Study
Hyp. 1 (*revised*) / coalitions	On major controversies within a *mature* policy subsystem when policy core beliefs are in dispute, the lineup of allies and opponents tends to be rather stable over periods of a decade or so.	This hypothesis *is relevant* for this study, because 1) it focuses on the coalitions and their actors and 2) it gives conditions for the longevity of a major dispute when policy core beliefs collide.
Hyp. 2	Actors within an advocacy coalition will show substantial consensus on issues pertaining to the policy core, although less so on secondary aspects.	This hypothesis *is not relevant* for this study, because 1) to establish what actors belong to which coalition one has to determine some core consensus among actors on specific issues and 2) the division between policy core and secondary aspects is not clear enough for a very promising application.
Hyp. 3	An actor (or coalition) will give up secondary aspects of his or her (its) belief system before acknowledging weaknesses in the policy core.	This hypothesis *is not relevant* for this study, because 1) it closely relates to the previous hypothesis.
Hyp. 4 / Policy change	The policy core attributes of a governmental program in a specific jurisdiction will not be significantly revised as long as the subsystem advocacy coalition that instituted the program remains in power within the jurisdiction - except when the change is imposed by a hierarchically	This hypothesis *is relevant* for this study, because 1) it gives insight into conditions for a change of the policy core or its attributes and 2) it considers the power of the initiator within developing policy structures and governing rationalities.

[2] Hypothesis 6 & 7 would be interesting to be considered within a follow-up research on this policy sub-system. Collected data for this study could provide with detailed insight about specific discussions from conferences and similar to refer to the 6th hypothesis. However, this cannot fit into the scope of this study.

	superior jurisdiction.	
Hyp. 5	The policy core attributes of a governmental action program are unlikely to be changed in the absence significant perturbations external to the subsystem, i.e., changes in socio- economic conditions, public opinion, system-wide governing coalitions, or policy outputs from other subsystems. *Revised version:* Significant perturbations external to the subsystem (e.g. changes to socioeconomic conditions, public opinion, systemwide governing coalitions, or policy outputs from other subsystems) are a necessary but not sufficient, cause of change in the policy core attributes of a governmental program.	This hypothesis *is relevant* for this study, because 1) it is about policy change, 2) it got revised in that external perturbations play a more important role for policy change. However, are not sufficient on their own and, 3) it links (major) policy change to external stimulus besides learning.
Hyp.6 / learning	Policy-oriented learning across belief systems is most likely when there is an intermediate level of informed conflict between the two coalitions. This requires that a) each have the technical resources to engage in such a debate b) the conflict be between secondary aspects of one belief system and core elements of the other or, alternatively, between important secondary aspects of the two belief systems.	This hypothesis *is not relevant*, because 1) it requires a systematic and detailed analysis of one aspect of the dispute rather than that it considers the development and general policy change of the policy sub-system.
Hyp. 7	Problems for which accepted quantitative data and theory exist are more conductive to policy-oriented learning across belief systems than those in which data and theory are generally qualitative, quite subjective, or altogether lacking.	This hypothesis *is not relevant* for this study, because 1) it focuses on conditions for learning, 2) it assumes that conflicts are less about deep core beliefs if they involve generally accepted quantitative data and theory and 3) the implications presented within this hypothesis are already considered with the involvement of the concept of the

		epistemic community, and 4) it assumes a superiority of quantitative data to qualitative data for learning. However, considering policy change in the dispute on GMOs involves exactly this as part of the dispute.
Hyp. 8	Problems involving natural systems are more conductive to policy-oriented learning across belief systems than those involving purely social or political systems because, in the former, many of the critical variables are not themselves active strategies and because controlled ex-perimentation is more feasible.	This hypothesis *is not relevant* for this study, because 1) it focuses on learning conditions specifying the impact on learning in natural and social systems, 2) it assumes different chances for learning for both natural and social sciences, and 3) it neglects the importance of cultural and other perceptual filters to perceive and understand events, information and data.
Hyp. 9	Policy-oriented learning across belief systems is most likely when there exists a forum that is a) prestigious enough to force professionals from different coalitions to participate and b) dominated by professional norms.	This hypothesis *is not relevant* for this study, because 1) it refers to conditions enhancing chances for learning across coalitions and 2) it refers to learning which has to be studied in more detail as a following step after this research.

(Sabatier, 1999:124-148)

The *first* hypothesis is related to the second sub- question establishing an overview of actors and beliefs of various time periods. From here on the focus is on changes. The overview will help to crystallize major aspects impacting change directly and/or indirectly. Towards the end of the research a table for each time period will present all results on actors, advocacy coalitions, belief and policy programs (see Appendix: Time Period Tables 1-5, p.58-60).

The *fourth* hypothesis will be referred to when considering the influence of the EC (first period) but also the influence of economic aspirations of created structures and policy programs of the second period. Whether an advocacy coalition or certain actor remains in power or looses its power is understood as being presented through policy reaction. Policy reaction as such can be seen as indicator for internal or external change from cognitive and/or non-cognitive sources

impacting the constellation of actors and/or resources (also positions) within advocacy coalitions. These changes indirectly or directly impact the support of certain beliefs (and policy reaction) rather than others within the domain.

Hypothesis *fife* can be reflected up-on by referring to the time period tables (1-5) and general findings of this research. Of course conclusions stay limited in that we cannot be sure whether there would have been no change of actors if an external perturbation (on system-wide changes) would not have occurred. Sabatier points out, that an external perturbation is necessary but not sufficient for policy change. Each major policy change should thus be accompanied by some external perturbation.

With regards to knowledge there is one major aspect which is not satisfyingly covered by the ACF. Mainly this concerns a nascent sub-system were AC's are not yet formed, but a small actor group influences the building of a political domain. In highly scientific areas policy creation maintains a close position to scientists and their knowledge to cope with technical matters. This part of the scientific community can be understood as an epistemic community, they are specialists of a common field, sharing a specific scientific view on the world, using same methods and evaluations in order to understand and deal with 'problems' and/or reality.

The concept of the epistemic community (EC) by Haas points to a special position of scientists belonging to one EC (a group of scientists from the same field using similar methods) especially within environmental and/or highly technical policy disputes. According to Haas the EC is understood to hold power over the most important resource for decision-making in such areas, namely over knowledge and its communication. The concept divides between an epistemic community in high consent over the problem and involved technicalities and an EC with low consent. Depending on this the influence over policy outcomes and the public attitude is either very dominating or weak. The more all scientist involved agree on aspects the more likely that they can dominate with this knowledge the policy outcome. If they themselves question involved methods and estimations consent among them is low. This low consent casts doubts on the accuracy of their in-put and hence, weakens their influence on policy outcomes and measures (Haas, 1992).

The ACF does consider scientists as part of AC's, however, in cases of common beliefs within the EC the ACF gives a too weak role to scientists within the policy domain. According to Haas the EC dominates the problem definition and therefore the evaluation and choice among

solutions. Especially in cases where the EC is in strong consent about its beliefs and where the policy area is strongly dependent on knowledge, it is the EC steering the whole domain (see Figure 2).

For the sub-system on biotechnology it is therefore also important to consider the role of the EC. The domain indeed depends on the input of science and the communication of knowledge. The EC closely involved within study and research on biotechnology can therefore be seen as being the first to ask for and the first to be around to influence regulation. As such they are the initiator, agreeing on and including various concerns towards this practice and its use.

Figure 2: Epistemic Community

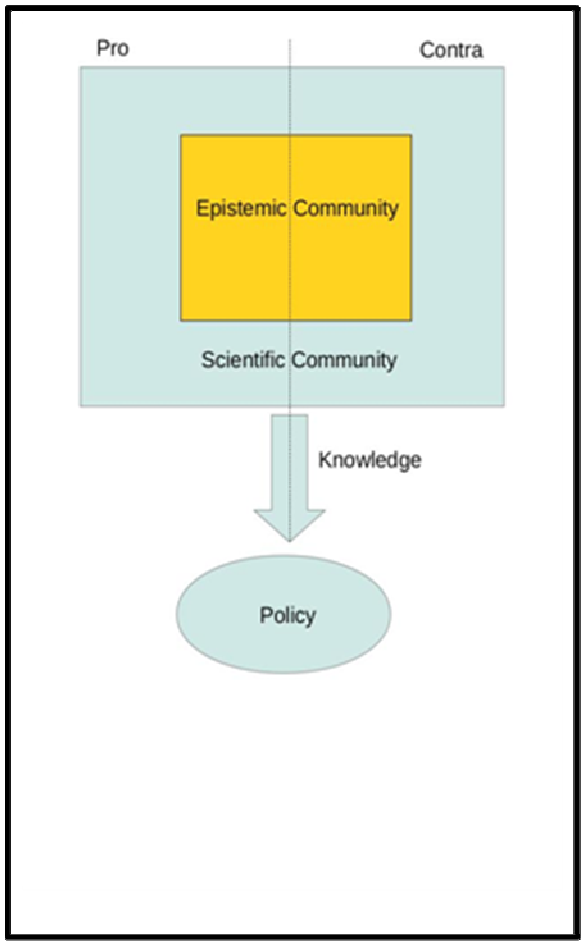


Figure 3: ACF Simplified

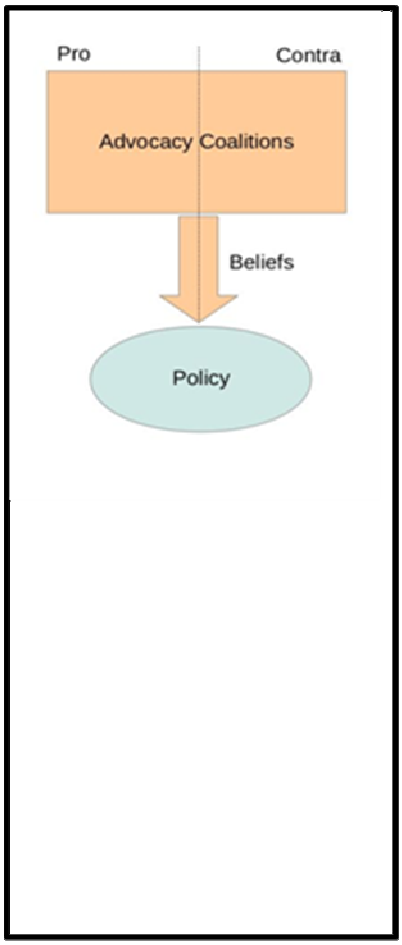
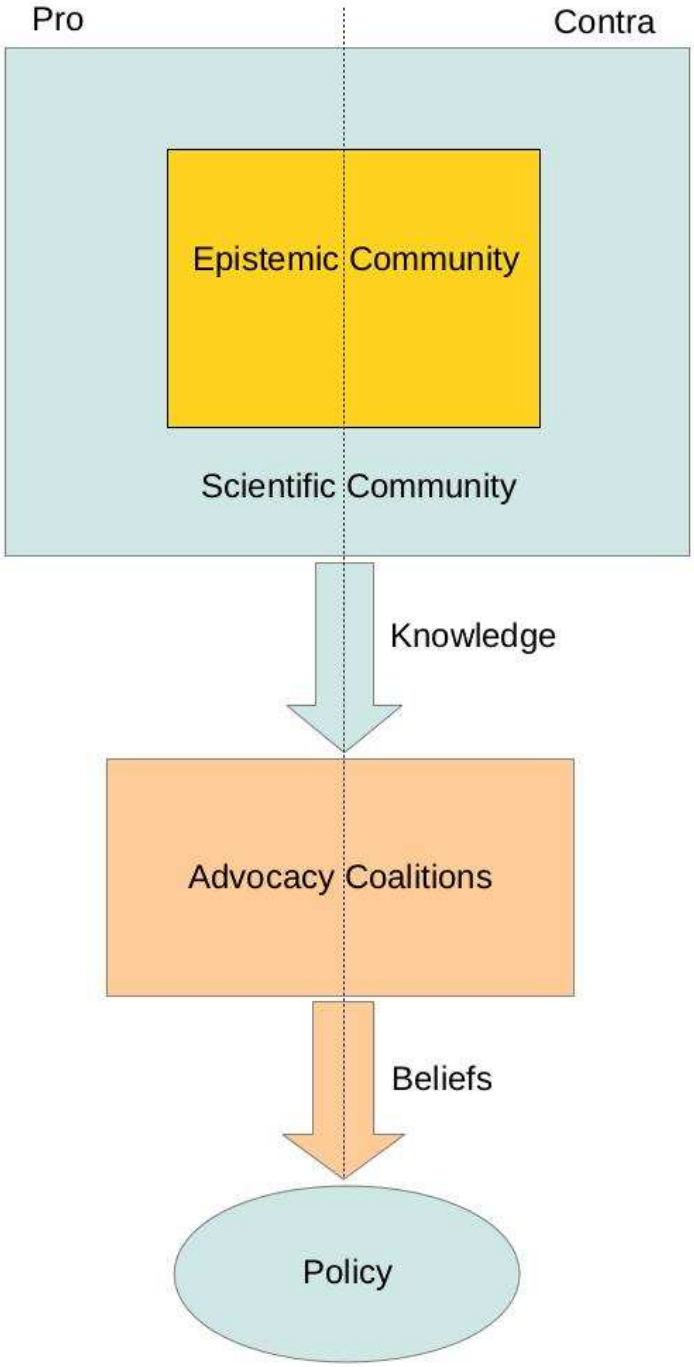


Figure 4: Combining the EC and the ACF



Involving both frameworks to explore this policy domain leaves with a variety of sources of data to consider. In order to structure this it is important to keep an over-view on related sources of data and methods to analyse them with. The hypotheses give already clear indicators, however, data has to be collected and structured accordingly. A table presents sources of data and the chosen method of analysis (Table 2).

Table 2: Sources of Data

Sources of Data	Method of Analysis
Scientific articles and books	Scientific articles and books are used to distil information on GMOs, their history, beliefs, policy change and other aspects explored in this research.
Official documents, legislation, and position papers	Looking for the general thinking behind policy decisions, legislative changes, and the involvement of participants and their concerns and visions.
GMO Experiences and Projects	Collecting facts, data, and statements according to affiliation to AC (a) or AC (b).
Interviews and questionnaires[3]	*Qualitative interviews and key questions concerning:* 1) Affiliation to ACs 2) own perspective and belief regarding GMOs in general, their risks and benefits; 2) personal motivation for involvement; 3) personal experiences with organizations, institutions, and GMO crops; 4) open question regarding changes within and among coalitions (cooperation, discussions, openness). *Questionnaires and systematic collections of statements of actors as to their:* 1) position; 2) advocacy coalition; 3) opinion on the relationship between nature and humans (cultural theory).
Conferences / Discussions / Work Shops: *1) Jenseits des Wachstums 20-22. Mai 2011 (Berlin); organized by Attac, and supported by among others, Heinrich-Boell Stiftung, Friedrich-Ebert Stiftung, Rosa Luxemburg stiftung, and Otto Brenner Stiftung.*	Actors and organizers. Actors and organizers give insight into ACs' constellations and their motivations (by considering statements and questioning people from different actor groups, the general public, and organizers).

[3] Used are interviews done by me and questionnaires done by others.

2) Bt-Maiz Anbau in Brandenburg 21 June 2011 (Berlin); organized by NABU. *4) Pressekonferenz NABU Berlin 2011* *5) NaWIS* *3) Panel discussion EP 2012*	Recordings were systematic scanned for facts and data, opinions, and other statements. Collected according to affiliation to ACs.
Press Releases and News Articles	The most relevant headlines of press releases were scanned for facts, history related information, and mentioned actors, their affiliation, and statements. Detailed analysis of all EurActive News from the year 2011 including the key word: 'gmo'. Collection of data.
Websites of members of ACs	Websites are used to determine actor groups, their beliefs and their affiliation. Also access to information as to the timeline of GMOs is used.
Documentaries	General disputes and legal fights mentioned give insight to their relevance for different ACs. Different perceptions and experiences become very clear. Looking for facts, events, experiences, beliefs and affiliation to ACs.

CHAPTER 3: HISTORY

In this chapter the focus is on five time periods which are separated through their main characteristics. Different periods established here include two short periods (around 3 years) which each should be viewed separately because they are so significant. One is the beginning which cannot yet actually be seen as a political sub-system and the other includes only the time the Moratorium lasted. The other three periods present timeframes around a decade or more according to Sabatier's hypothesis 1. The revision of this hypothesis was necessary because as such it is applicable to a mature policy sub-system (not a nascent one). One period (Millennium Period) overlaps with the previous one (Moratorium Period) because significant policy incentives were determined a year before the Moratorium ended and which strongly influenced the shaping of the Millennium Period.

In general, to understand policy change in the area of biotechnology we cannot expect history to present one clear event which then presents a new policy phase and thus indicates policy change. During one phase there can be minor changes which slowly impact the actors involved and the policy sub-system in its basics (e.g. composition, resources) possibly leading towards a new time period with different principles and/or structures. A recognized shift does not necessarily lead to a major policy change. A shift can change some attitudes and/or the scopes of concern, also in legislation. However, these changes do not necessarily impact the core of the governmental program in its actual implementation. Therefore each time period will be presented with the most relevant aspects regarding the hypotheses of the ACF and the research question. As already mentioned within the method part, these are the beliefs, the actors of advocacy coalitions, policy core attributes and possible external perturbations.

Period *one* is called ***'Science Phase'*** and stretches over a period of around 8 years, for Europe the most relevant of these are the fife years from 1974 till 1979. The *second* period is called ***'Iron Lady Phase'*** which goes from year 79 till the end of the 80's. The *third* period is called ***'Green Phase***' which spreads from the end of the 80's throughout the 90's. The ***'Moratorium Phase'*** lasts from 1999 until 2003 and presents the *fourth* period. The ***'Millennium Phase'*** presents the *fifth* period until today (2002-2012). The last period presents the longest and most detailed time frame and will thus be more extensive than the rest.

1.1 PERIOD I (Science)

The beginning of the science phase goes hand in hand with the beginning of genetic engineering. As mentioned earlier genetic engineering is a process with which genetic codes can be altered impacting specific characteristics of an organism. Changing the DNA structure of an organism fits perfectly to utopian views to society. *Science fiction mostly uses technological development as impact to huge societal changes. With regard to biotechnology it is mostly humans' characteristics which are oppressed, altered or modified and improved.* As such this view related to biotechnology research underlines the opportunities and better quality of life which lie within this technology. However, in science fiction literature and movies any utopia carries its dystopian attributes. Related to biotechnology this distinctly different view, namely the dystopian vision sees the research as 'playing god' and 'opening a Pandora's box with frightening and unknown consequences' (Gaskell, 2005:82-83; Abels, 2002).

First beliefs lead scientists to do research with bacteria. The latter brought together a small group of scientists supported by the scientific community to call for a ban on genetic engineering (Berg et al., 1974). They did acknowledge a lack of insight on risks posed to researchers in laboratories and citizens close to research facilities. Especially with regard to the release of GMOs they were uncertain about the actual risks. No one knew exactly what would happen if this new technology would be released into our 'natural' ecosystems (Gottweis, 1998:3). This ban was called for in the Berg letter recommending a moratorium on certain experiments until safety questions were addressed. After the 'Berg letter' the UK became a major player in Europe by leading the scientific community to follow the recommendation and introduce a moratorium (Dunlop, 2000).

At the Asilomar Conference in 1975 we see again that a number of scientists involved in biotechnological innovation asked for regulations and proposed a self-imposed moratorium on research until potential risks were clarified. In order to increase knowledge about risks research was perceived as essential (Berg et al., 1975). To enable research once more leading scientists (140) discussed possible future regulation. They proposed guidelines of safety provisions for research, restricting especially the deliberate release of GMOs (Krimsky, 1982).

We thus see that the beginning of the policy sub-system concerned with GMOs is dominated by opinions of the scientific community and in specific directly involved researchers working with

the new technology in laboratories (in the U.S. and EU) (Gottweis, 1998:4). They were not only the ones who initiated and propagated genetic engineering but they were also the ones to discover and highlight the potential risks of genetic engineering. Both, benefits and risks were acknowledged during this phase, but no one actually new what these were (Bandelow, 2006:749). Scientists were thus open to the earlier mentioned utopian and dystopian views. With this they established two distinct believes framing this new technology either positively or negatively (Tait, 2008).

1.2 PERIOD II (Iron Lady)

The second phase that we can distinguish in the case of biotechnology and GM in specific starts in the late 70's and is in line with the political strategies of Reagan and Thatcher (Britain's Iron Lady) in which privatization, commercialization and market incentives gained in importance (Hoppe & Peterse, 1993). During the late 70's first results of research in laboratories stimulated interest in possible applications and commercialization of biotechnology. The focus shifted from fundamental research and an academic purpose, mainly financed by governments, towards applied science financed by private capital. "[This] generated a change in attitudes and research emphases: from sole scientific values, towards the inclusion of economic values." (Devos et al., 2008:36).

In the realm of these 'societal changes' also research institutions and universities were increasingly motivated to incorporate market mechanisms and business interests into their research schedules. One example is the British Spinks Report stimulating commercial exploitation of research and biotechnology (Spinks Report, 1980; New Scientist, 3 July 1980). Scientists became increasingly part of innovative production oriented laboratories with the goal to not merely produce knowledge and data but create something which can be commercialized.

With regards to biotechnology and its economic values a general shift can be noted during '79 and '81. The first GM plant was developed in 1981 supporting visions related to chances for various sectors including agriculture. Companies and industries started to recognize this new technology as a lucrative investment opportunity (Devos et al., 2008). However, commercialization on global levels and especially the release of GM plants into the environment raised new questions concerning potential risks of biotechnology to the environment, to animals and to human beings, which became a part of risk perceptions (Devos et al., 2008:38).

In general, debates about biotechnology remained dominated by scientists. However, new public entities entered the fray because of the new considerations that were raised. Health and safety bodies, environmental groups and the agricultural sector now also had a stake in how GM crops were developed and released.

Although in Europe the debate included social and ethical considerations, scientific and technological ones remained dominant. The dominating belief was that 'unscientific' opinions had no role in a highly scientific technology development (National Foreign Trade Council Inc.,

2003:6). This predominance of science and market was once again underlined in Council Recommendation 82/472 which deemed existing sectoral level legislation as sufficient to oversee the technology's development. Considering sectoral level legislation focuses on technical methods and a market approach this recommendation placed scientific and technical considerations above normative ones. Thus, in practice a top-down approach could proceed to steer regulation focusing on science and market as the main contributors to actual policy outcomes. The actual involvement of health and environmental actors remained limited.

Not only on a European level, but also on the international level scientists were confirmed as the major players in this domain when the OECD presented the 'Blue Book' in 1986. In its intergovernmental basic framework for risk assessment of this technology it recommended that risk assessments be performed in a *technique* style approach on a *case-by-case* basis. These international events influenced general perceptions (Devos et all., 2008:39).

In conclusion, we see that during the Iron Lady period scientific and technological considerations on biotechnology remained dominant ('utopian belief') even though normative considerations ('dystopian belief') were part of the debates. New actors gained some significance such as health and safety organizations and environmental groups. The increased focus on markets and commercialization introduced the agricultural sector and the industrial research sector as significant players. However, scientists remained as the major players due to the significance placed on science and technology and the seeming reluctance of actors such as the EU to make major policy or legislative changes. A new constellation of interdependencies strongly linked to market interests replaced the *constellation of science* from the previous period. The dependencies of scientists got intertwined with industrial interests and industries became more involved within interest groups influencing political aspirations. Industrial considerations and economic methods for issues at hand became dominating in shaping positions of politicians. This change of composition and given resources gave strength to proponents of GMOs to advocate presented opportunities and utopian related visions to biotechnology during this time period.

1.3 PERIOD III (Green)

The slowly increasing attention towards environmental concerns and affects of technologies and production methods on societies were pushed towards the centre of public and political attention in Europe through for example air pollution and acid rains during the 1980's and the Chernobyl nuclear disaster in 1986. These events and especially the nuclear disaster stimulated a sceptical attitude (negative framing) towards technology in general, its impacts on societies, health and the environment. This was also reflected within (national) politics in Europe shifting towards 'green' party argumentations. Therefore this period is called the 'Green Period'. Green parties gained in prominence and environmental and nuclear safety became hot topics in public and political debates in several European States.

This political attention on national levels was also mirrored on the European level through the rather 'green' tone of the Viehoff Report of the European Parliament (EP) in 1987. This report challenged the product oriented international ideas of the Blue Book by acknowledging and underlining 'special risks' posed by genetic engineering. Contrary to the views of the Blue Book it denied a notification of research alone to be sufficient and furthermore underlined the need for other considerations besides merely technical assessments. The European Parliament was strongly impacted by environmental groups who strongly criticized that GMOs were released into the environment without considering all possible consequences and not just technical ones. These groups also advocated the establishing of management principles and adequate legislation before any further release (Cantley, 1995:542).

However, proponents promoted the positive frame pointing towards the technology's opportunities and advocated politicians to see that not acting would be 'missing out' on benefits of the technology. Some governments also promoted biotechnology citing scientific evidence to argue that adverse effects were unlikely, e.g. France and United Kingdom. To '[…] attract R&D investment, to enhance economic competitiveness of European agriculture, and to reduce environmental impacts of agriculture […]' was seen as being 'better' than inaction (Levidow, et al., 2000:193).

Although the industry clung to its utopian view of biotechnology, its lobby was not yet strong enough to directly influence policy outcomes on biotechnology in Europe (Rosendal

2005:88; Cantley 1995:535-537; Greenwood/Ronit 1992). Add to this the pressure of a fast spreading mal public image on biotechnology, industry recognized a need for regulation to affect public trust and change the sceptical attitude in Europe (Levidow, 2000:193). Ensuing, the Bergman report on the promotion of a competitive environment for biotechnology (even) admitted that, '[…] biotechnology suffers from a bad image amongst policy-makers and the general public […]. Although some of the expressed fears seem exaggerated they are, nonetheless, of great political influence. It is imperative therefore, that problems of public acceptability, and ethical questions raised, be recognized and dealt with." (Commission, 1991:41).

Although on different sides, both the so-called *utopians* and *dystopians* were in favour of regulation. In the eyes of the industry a common legislative framework for the European market was seen to simplify the introduction of biotechnology and GM products in Europe, while in the eyes of environmentalists this presented an opportunity to include environmental considerations. Two directives were adopted in 1990: Directive 90/219/EEC regarding the contained use of GMOs (laboratory and safety issues) and Directive 90/220/EEC on the deliberate release of GMOs for field experiments and for the placing GM foods on the market (rules for pre-market authorization and experimental release). Environmental and health concerns were reflected in article 16 of the Directive 90/220/EEC which held a safeguard clause allowing member states to take protective measures in their territories if evidence on risks for human and environmental well-being could be shown.[4] In essence, one could say that the environmentalists won this battle because the common legislative framework the industry was striving for, was not achieved, and more importantly because member states were implicitly given the liberty to take normative aspects into consideration. Bandelow goes so far as to say that the competencies given to DG XI (Director General for Environment, Nuclear Safety and Civil Protection) who had close relations to opponents of biotechnology, were an important reason why directives were filled with demands of environmental groups instead of utopian visions and technological opportunities (Bandelow 1999:104-106).

Environmentalists had more victories both on an EU and an international level. In 1992-1993 European Policy was changed through the Maastricht Treaty (Maastricht Treaty, 1992). This treaty established credence to the 'polluter pays' principle and the precautionary approach.

[4]EU legislation has to be 'translated' into national law. This gives some room to implement laws considering existing varieties between member states' jurisdictional, political and cultural systems (subsidiarity principle).

The first clearly negatively impacted the industry which would now be forced to look closely to its production techniques and be responsible for the consequences. The second in essence took distance from the utopian view by emphasizing potential risks. The actual implementation of these principles, however, was mostly left to the authority of member states under the subsidiarity principle (Moltke, 1995).

On an international level two agreements shaped the perception on biotechnology and the development of regulation in Europe in 1992. The Rio Declaration on Environment and Development (Agenda 21) established the term sustainable development, putting forward 27 principles supporting it. Principle 15 also introduced the so-called *precautionary approach*:
"In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

Nonetheless, the industry did not lose completely as Chapter 16 of Agenda 21 points to the important role of biotechnology in contributing to strengthening the sustainable production of food, feed and fibre, health care and environmental protection. Due partly to a still relative lack of organized protests in most member states (except Germany and Denmark), the biotechnology business boomed in the mid 90's. Several GMOs were approved to be introduced to markets and field trials were performed. In 1996 the U.S.'s first transgenic crops (GM soybeans and corn) were approved for sale and GM cotton was commercialized. GM soybeans were imported by Monsanto to Europe.

The industry was fuelled with confidence towards biotechnology, its application and opportunities but the increase in the development and use of biotechnology raised concerns about risks and unknown implications among environmentalists, farmers and consumers (Tait, 2008:6; Levidow et al., 2000:195). Non-profit organizations like Greenpeace initiated 'information' and action campaigns raising consumers' awareness. Consumer concerns and questions about food safety became louder (New York Times, 7th November 1996). Organized protest like boycotting ships trying to import GM products into Europe raised further attention (Greenpeace Press Release, 8th November 1996).

Actions like these strained the biotech industries and their efforts to import GMOs to European markets. American Industries (main producers of GMOs) complaint about profit losses. During the end of the 90's public activism contra so-called 'Franken-foods' gained in

prominence and press attention. This steered-up consumer concerns and a sceptical attitude against GMOs (L.Weasel, 2009). As a response to these increasing consumer concerns some of the big supermarket chains started taking GMOs out of their shelves (L.Weasel, 2009:39). Such reactions were further stimulated by an increased attention of the press. Fear spreading about the safety of food products steered politicians towards supporting a sceptical stand on biotechnology products and their possible risks. The BSE crisis also played a role as scholars point out that the crisis affected consumer awareness and scepticism in Europe against governments and industries and their methods of assuring food safety (L.Weasel, 2009). For actors with a dystopian vision these events supported their concerns and actors felt justified even more so to underlined a negative framing of GMO food and feed products, and opposing any commercialization of such.

Different protagonists, from environmental groups to consumer groups to scientists, influenced the debate and questioned safety considerations. As result (some) governments promoted more precautionary measures. The temporary boom was therefore followed by a decline of approvals and permits starting in 1997. In order to secure the functioning of the internal market against these declines the Council and Parliament formulated the Regulation No. 258/97 on 'novel foods' which supplemented the deliberate release directive of 1990. As a main difference this Regulation formulated the *substantially equivalent principle* for GM food. This means that novel foods produced from GMOs can be considered equivalent in their composition to other food products already on the market (e.g. their conventional counterparts) and can be introduced to the market through a simplified procedure (Mike Adcock, 2006). These policy changes furthermore reaffirmed the role of scientists and labelled them as the 'sole authority' for policy creation on GMOs.

The EC was no longer in the same constellation than during the nascent subsystem. As pointed out structural changes and resource dependencies had increased economic considerations, ratio and beliefs among actors of the EC. Nevertheless, some scientists got also involved in the dystopian camp.

Although opponents had been vying for the inclusion of normative aspects, it wasn't until the Green Period that they finally succeeded. The coalition of opponents gained new actors in the form of NGO's (including environmental and consumer groups), the press, the general public and also politicians affected by the issue and the opinions of these new actors. The adoption of

the precautionary approach was a major victory and a distinct change in policy in this domain. However, the biotechnology business boomed as the potential advantages of biotechnology remained. The industry in this period also had a win in the form of the adoption of the substantially equivalent principle which left them much more room than was desired by the opponents. Furthermore scientists remained major players as their role was reaffirmed. With regard to this scientists were responsible for the degree of the involvement of 'other' aspects within policy decisions on biotechnology. Nonetheless, the inclusion of normative aspects in both the debate and in policies is viewed as a major victory for the opponents and this period can thus justly be called 'green'.

1.4 PERIOD IV (Moratorium)

Confronted with a declining trust of the public and an increasing awareness and cautiousness towards biotechnology politicians in several countries started to oppose new import applications of GMO products. Following this, six member States put a *'de facto' moratorium* on the commercial licensing of new GM products in place in 1999 (Austria, Denmark, France, Greece, Italy and Luxembourg). These countries demanded a revision of the Directive 90/220 which incorporated the safe guard clause, and agreed to approve no new GM products until then (Jan-Peter Nap et al., 2003:11). In 2001 Directive 2001/18/EC was adopted in which the precautionary principle was no longer indirectly incorporated as a safeguard clause but became the guiding principle much to the delight of opponents (Kutay Kesim & Selen Ayirtman, 2006:5). However, this directive killed two birds with one stone, or rather pleased two birds with one treat as the substantially equivalent principle remained intact to the delight of course of proponents of biotechnology.

The Moratorium period was strongly influenced by the line drawn in the sand by particularly the politicians and regulatory institutions. Europe's moratorium came in dispute with international trade agreements and tensions rose culminating in the U.S., Argentina and Canada bringing a case against Europe to the WTO court. In the eyes of the countries dominating the production of GM foods and feeds, Europe's procedures were not in accordance with international law, namely the *non-discrimination principle*, and hampered their business opportunities. The ruling of the WTO court agreed with these accusations and pointed to the need of a revision of EU laws and procedures on GM products and their import requirements. With 1148 pages this ruling is the longest ruling ever established by the WTO.

Officially, the WTO ruling did not establish that GMOs could be seen as safe nor did it dismiss tight regulations for safety measures in general. Nevertheless, it gave increased value to pro-market argumentation (of proponents of biotechnology) by supporting the equivalence principle and reducing the importance of precautionary measures against 'special risks'. Potential risks are perceived as limited to not existing. Socio or environmental grounds were diminished in their affectivity as reason to discriminate against genetically engineered products. The 'de facto moratorium' between 1999 and 2003 was declared to be breaking trade rules. This strengthened the advocacy coalition pro-GMOs and their argumentation lines and beliefs

(Skogstadt, 2011:3). Though, opponents tried to appeal against this ruling, the Commission decided to accept the WTO ruling in 2006 (EurActiv News).

In conclusion for this time period it is clear that strong pressures from the public, some national governments and the European Parliament lead to a clear political response against GMO imports. This period shows the actual strength of national governments on the one hand, but also underlines the international dependencies on the other hand. Although member states took a stand and adopted a ban on GMOs, international pressures managed to create a win for the proponents of biotechnology. With regards to this various actors have been at play using information to their advantage regarding their visions for either the potential of or the risks posed by this technology.

Nevertheless, regulation fell short to address existing concerns and produce decision-making structures to tackle the development of biotechnology products and their release into the environment. It seems Europe wanted to follow the stream towards economic prosperity using unknown opportunities of this technology by simplifying risk assessments while actually also wanting to proceed with a precautionary approach in order to best cope with unknown risks. Legislation became the middle ground trying to include two opposing visions and their strategies, instead of trying to face uncertainties and 'honestly' tackling the issues at hand.

1.5 PERIOD V (Millennium)

The new Millennium linked future society scenarios to technological development just as in so many science fiction literature and cinema. With regard to this science and technology were on the one hand strongly supported and seen as hope for 'our' future survival and comfort, while on the other hand science and technology were seen to neglect human sentiment and care for nature, and therefore actually endangering our survival and leading towards an increase of the gap between the privileged and the poor. Following these views questions about how we want to develop our societies and therefore develop technology were the core of the dispute. It is obvious that the utopian and dystopian view strongly divide opinions on social and technological development. Throughout this period, advocacy coalitions of biotechnology remained in their opposing camps looking through different lenses towards the development, the significance and the risks of this technology.

Although since the 80's the potentials of biotechnology have been highlighted and the utopian frame has dominated several politicians, companies and scientists, it wasn't until the Millennium period that biotechnology was promoted as *the* important contributor to tackling general development goals of Europe. We would not be able to tackle challenges, both practical and ethical, posed to our society if we did not participate in this innovative and promising area. The costs of remaining in a precautionary stand would be much higher than the costs related to the potential losses related to the use of biotechnology. That was the argumentation that reigned supreme during this period. Accordingly the Millennium Period emphasizes innovation, research and expert oriented decision-making.

In 2002 the EU officially put innovation at the core of Europe's economic and social development in its Innovative Future Strategy (IFS). Biotechnology was crystallized as to play an important part in this. Though the precautionary stand was the guiding principle to cope with uncertainties and missing scientific data in Europe, precaution does not imply to neglect research all together. Instead, in order to decrease uncertainties and to understand more about possible hazards and develop the potential to use benefits of biotechnology, the IFS called for more research and created additional funds for this (McEnery, 2009). The actions of the EU Commission were thus in line with proponents' visions on biotechnology.

Congruently there was a rise of research into GMOs leading to more product development and interests in their commercialization. In order to cope with the newly created associated tasks of applications and risk assessments and such, a new expert body, namely EFSA, was created in 2002. EFSA is an independent scientific body concerned with safety issues related to food and feed. By providing expert advice on safety guidelines EFSA is also meant to increase trust of the public towards food safety (Wendler, 2005). Throughout the last decade, however, questions were raised about conflicting interests of EFSA experts because of their linkages to industry. This actually led to a decline of public trust towards expert bodies and institutions rather than an increase.

This sceptical attitude towards EFSA, its members and GMOs was further stimulated by examples like the application procedure of MON863 by Monsanto in 2002. Critical voices, Greenpeace and CRIIGEN, demanded access to the data to confirm EFSA's findings. At first access was denied under confidentiality claims of the company. Only after Court cases, media attention, specifically in *Le Mond*, and many public debates the German Court in 2005 finally allowed Greenpeace access to the data. In 2007 after a peer review process the scientific journal Archives of Environmental Contamination and Toxicology published the study of CRIIGEN determining some mistakes in the statistical presentation of results. Opponents stated that EFSA had been somewhat hasty or sloppy or both in determining that the product was safe (Greenpeace, 2007).

Cases such as these did not only contribute to the public's awareness of institutional practices but also to its awareness of the strength of industrial control over people's food, risk related research and data. Through mergers and ventures most patents related to GM crops by now belonged to a handful of corporations. The patents and confidentiality rights denied access to specific data and genetically modified seeds to second or third 'persons'. This limited chances for independent researchers to study GM crops, their effects and potential risks. Only in some cases was it possible for independent organizations to validate the test outcomes of research done by the corporation's (Food Inc., 2003:93).

Another way in which corporations exerted and gained control was by extending their influence to Southern countries. Prominent activist Vandana Shiva raised awareness about corporations' concentrated power over food supply and seeds in for example India where local farmers are ardently fighting for their independence from these big conglomerations (Vandana Shiva: The Future of Food). Activists such as Shiva argue that the actions of corporations in these

countries have undesirable socio-economic effects (Food inc., 2003). So far, the argument of socio-economic effects was used by proponents to underline the great potential of the technology to benefit society, but with this new evidence opponents gained strength against such claims. Interestingly enough the opponents also gained in numbers as the increased interest and awareness of the public lead to more socially active groups in this domain such as farmers' and women' organizations.

In 2003 member states finally had to lift the 'de facto' moratorium but not until they adopted new legislation which presented measures and methods for labelling, monitoring, and addressing traceability of GMO products. By doing so they addressed certain concerns from consumer groups. However, Eurobarometer concludes that the concerned public is until today questioning the usefulness of biotechnology, its moral acceptability and generally perceives it as a risk to society. The public thus remains ambivalent (Bonny, 2003). Opponents continue to underline possible dangers of deliberate release of GMOs and question the actual free choice of consumers and producers. Socio-economic effects have shown to be much contested in the last years. Experience reports from various countries show indeed the opposite (Vandana Shiva et al., 2011). Friends of the Earth (FoE) had in 2010 published a report on hidden economic and social costs of GMOs (FoE, 2010). In a global effort a new report on experiences of farmers and communities was created by several people gathering data from various countries. This report was presented by Vandana Shiva (political activist from India) and Renate Kunast (chairwomen of the green party from Germany) at a Press conference in Berlin on 7.12.2011 (Press Conference, 2011).

During this period questions were also raised about the actual possibility of agricultural products co-existing in harmony. So far proponents had extenuated any possible problems with co-existence but several cases forced acknowledgment of the fact that non-GM fields were contaminated by GM fields (Bergstedt, 2010:132, 136-140). The conflicts arising out of these become apparent in two major court cases, one in Europe and one in Canada. The Canada case presents a nasty power battle of a big corporation against a farmer starting in 1998. In this case it was the corporation who demanded some reparation because of unlawfully used patented GM seeds by the farmer. Implied was that the farmer did this on purpose and that anyhow it would be his responsibility to protect himself (his fields) from contamination. Only in March 2008, after documentaries, interviews, press releases and more around 8 to 10 years later the

court case was finally settled and Monsanto willing to pay all damages (Monsanto VS. Schmeiser). Against this the Watson court case in Europe underlined the liability of the company to protect farmers from contamination to according to the polluter pays principle from the Maastricht Treaty. The Watson case in Europe has nevertheless shown how difficult this principle is to be applied. Though, in Europe it was the farmer asking for reimbursement of 'damages' due to contamination rather than the company. Measures to payments, only counted after contamination had already taken place, preventive measures should be taken by farmers themselves in advance.

Contamination aspects were highlighted also after a control of seeds had shown that the U.S. had imported GM contaminated rice to Europe, without any approval. This and increased scientific attention stating that 'Monsanto's seed multiplication activities in the US could mean that soy shipments from the US could be contaminated' steered-up qualms about imports in Europe (Mitchell, 2007; Friends of the Earth, 2010). A strong lobby for a zero-tolerance to GMOs in imported products came into being. Opponents could not understand the arguments of proponents that downplayed contamination issues in deliberations of risk assessments and safety measures for agricultural biotechnology (Bergstedt, 2010:131-135). Based on simple biological considerations they regarded a danger in contamination of other food crops and the environment as possible.

The zero-tolerance expounded by opponents could have a significant effect on imports to Europe causing a counter movement against a zero-tolerance policy. Due to Europe's high degree of dependency on imports of certain products such as soy, zero-tolerance would impact major market players. New actors entered the lobby, especially animal feed suppliers and manufactures, who thought their profits in danger due to stringent control measures. Already strained by increasing food prices these actors pushed together with biotech corporations and the European food and drink sector to weaken EU GMO laws in 2008.

In their opinion GMO applications should be processed faster and the zero-tolerance to GMO traces in products should be neglected. Furthermore GMOs were promoted to be a solution to rising food and feed prices, whilst regulation of the EU was seen as one obstacle to secure farmers' economic situation. Proponents generally understood these external events (e.g. rising food prices) as a sign for the importance of GMOs and perceived an urgency to act in order to spread benefits of biotechnology faster. Practical feasibility of zero tolerance was no longer deemed possible due to the implied costs of achieving and maintaining zero

contamination. Politically, the decision was reached that products with an actual contamination of up-to 9% could be labelled as non-GMO products to keep quasi costs affordable (Peterson, 2011; ORGAP Project, 2007).

The ruling of the EU Court on 6th September 2011 in the 'Honey Case' changed the whole legal base for contamination once more (Karl Heinz Bablok and Others v Freistaat Bayern). In this case the state was sued for allowing honey to be contaminated by Monsanto's corn in 2005. The outcome was that national and international approval processes would be necessary for products with GMO traces in them. Opponents were given new 'hope' for the possibility of a stand against the acceptance of GM traces in imported products. This ruling gives more power to Europe and its member states to control general GM contamination within Europe, because it provides a legal base to increase controls and demand information on imports. This ruling will most likely be contested by demands of proponents. Nevertheless, at the moment this is a 'win' for opponents even though it might just be temporarily. For some Countries this will seem like a discrimination against their products and therefore can be seen as opposing international trade principles and agreements (similar to the Moratorium).

Europe introduced an alert system for Food and Feed. This control warning system of EU borders has found many contaminated imports during the last years. In 2010 alone, the EU issued 47 alerts over the presence of unauthorized GM rice in Chinese imports. Nevertheless, industry and prominent individuals such as EU Commissioner Dalli continue lobbying for the acceptance of traces of unauthorized GMOs in imports.

Member states still have diverging interests and opinions on biotechnology in (especially) agricultural practices and on specific safety related aspects. Besides new evidence including empirical data advocacy coalitions still remain in their opposing visions towards biotechnology underlining either its potential or its risks and negative affects. During this period a shift becomes apparent within the dispute. No longer is it about the chances on the one hand and the risks of the technology on the other, now also the methods used for risk assessment and management are understood differently. Not only in that they neglect ethical considerations and/or socio-economic factors but also in their simplicity (mainly technical considerations from bio-chemistry) compared to the complexities of living beings and eco-systems.

Scientific methods are perceived valid or not by the lenses of researchers and scientists involved. Including epistemic, cultural and ethical dimensions to this validation increases factors

which have to be considered for such. One easy example of the past was that when comparing the compounds of insulin and genetically engineered insulin (with DNA from pigs) no substantial differences could be detected. However, for a religious person, for example a Muslim, these generally valid technical methods to determine differences do not work in practice. For a Muslim this insulin would have never been accepted as being the same as synthetic produced insulin. Today, insulin is produced by a different technique using human cells and a bacterium (human-insulin). Alone this fact shows clearly how different validations of methods exist among people with a different cultural background, episteme or even scientific background.

Throughout this period civic society and policy officials (opponents) contested the credibility and reliability of science as input to decision-making (Greenpeace, 2007). Even the functioning and composition of EFSA did support these doubts against scientists and their methods rather than increasing trust of consumers in food safety. Nonetheless the Commission, clearly supporting visions related to proponents, gave biotechnology momentum through the innovative strategy which underlines the important role of science as input for policy-making in this period.

However, public and legal concerns made parties involved address management of contamination and liability issues in this period. In the U.S. corporations gained the upper hand when farmers were made responsible for preventing their fields from being contaminated by GM fields. In Europe this played out differently due to the 'polluter pays principle' established in the Maastricht Treaty. Farmers planting GM crops had to also start to establish measures against contamination. This led to a battle over market discrimination against farmers planting GM crops. The principle of free choice and same chances for all (non-discrimination in markets) held against demands of opponents to put all the costs on corporations. Therefore officially discussions moved away from a zero tolerance of contamination towards specific degrees of contamination.

Today the dispute not only relates to biotechnology and GM crops but also includes concerns about trans-boundary movements, co-existence and its management, and the actual free choice of consumers and producers against or in favour of GM products. With regard to this, organized activism has broadened and actors coming from different backgrounds within coalitions have increased. 'Traditional' and organic farming practices generally oppose GM crops and increased industrialization of agriculture in Europe or special regions. Many demonstrations and petitions

have been organized and a clear 'no' to GMOs has been given in Europe and especially in member states where alternative farming practices are more widespread, like Germany, France, and Italy. Several local grassroots initiatives also came into being to voice their disagreement against regional GMO research fields or planned commercialization.

After the WTO case had minimized the significance of environmental protection as reason to limit imports and commercialization of GMOs, new legal bases for member states and their regions to protect themselves against GMOs were called for. In Berlin public demonstrations and raised concerns lead politicians to decide against GM seeds and public order was proposed (to EU institutions) as a new legal base to deny seed imports and release projects in certain regions (EurActiv News, 04 February 2011).

Confronted with an ever declining trust of consumers towards products derived from genetic engineering, industry faced huge losses on European markets. BASF has stopped its efforts to sell GM products in Europe and has left the market with its genetically engineered products (application processes are still running though) (EURActiv News, 25.January 2012). Carel du Marchie Sarvaas, director at EuropaBio (one of the biggest industry groups involved with AC's) states: "The sad irony is that we import biotechnology products into Europe, and that means we're probably paying more for them than we need to, and we're losing research jobs to the places where they're being produced,". The opposing movements strongly showed BASF that there are no good chances on the European markets for their genetically engineered products. Opponents celebrated BASF's move out of Europe and Adrian Bebb from Friends of Earth (FoE) stated to the New York Times: "This is another nail in the coffin for genetically modified foods in Europe." (New York Times, 16 January 2012).

Another significant attempt to impact public attitudes (also towards institutions and corporations) and to increase quality of risk assessments during the last year are the transparency requirements to which corporations have agreed in Europe. Until then access to data was limited due to confidentiality claims and patents on seeds, and unauthorized researchers could not obtain data or seeds. Today independent researchers are actually allowed to access data of company research (e.g. animal feed-studies). Data can no longer be kept secret behind confidentiality claims, only names of researchers and the DNA sequence can be blacked out. This implies, however, that besides increased transparency efforts, confidentiality claims on the specific DNA sequences and the identities of researchers and scientists involved remain in

the hands of corporations. This limits the discussion among researchers about created tests and their results. Furthermore also political dialogues between ACs are limited through private rights over knowledge, and a low degree of trust towards opponents and their credibility. Therefore, learning among and across coalitions stays until today limited. Information is the tool for strategy rather than learning.

CHAPTER 4: ANALYSIS

In the beginning of genetic manipulation there were no political sub-systems or advocacy coalitions. Because there was no dispute about differing beliefs (though they existed), there were no actors advocating for their core beliefs. In the beginning though this subsystem is a so called nascent sub-system. Actors and beliefs in dispute are not yet developed clearly. What we instead see is the existence of an *epistemic community*. The main actors were scientists and researchers of laboratories and research facilities who were involved with this new manipulation process of DNA. The EC directly influenced measures and targets, indirectly determining strategies for political response. In the initiation phase clearly it was the EC holding power over the problem definition and the information leading to the creation of a political domain on biotechnology research.

All in all scientists presented a broad spectrum of beliefs and also related them to their practices and within considerations of how best to proceed with research. It is evident that two main differing beliefs came into being: one that saw the amazing role biotechnology could play in increasing the quality of life (utopian) and one that was very aware of the potential risks of an uncertain technology (dystopian). Despite differing beliefs the *epistemic community* agreed that additional knowledge was necessary, which is why they created safety measures and methods for assessing risks to enable further research. Involved uncertainties thus lead to a precautionary, yet prospect oriented stand towards this technology.

These two distinctive frames form the basis for the split that took place within the epistemic community. This split cost the EC its dominance over knowledge (resource to policy in-put) within the policy domain. Conclusions about safety aspects and experiences of benefits and costs of the technology stay uncertain (see Appendix: Box1, p.64). One camp sees no special risks at all while the other camp does. The strategies to assess and manage posed risks differ in that they are based on different assumptions, both mirrored in policies. In cases of 'no special' risks, procedures to determine and assess risk are simpler than for cases in which a 'special risk' is posed. We see that this is linked to the basic principles in dispute, namely the precautionary and the substantial equivalence principle. If GMOs are 'the same' they do not pose any special risk, however, if they are not the same, they do pose special risk. These diverging beliefs often result in criticism and discussions on methods used to determine risk and on conclusions drawn

about the actual safety of biotechnology. In both coalitions this basic belief about the 'safety' of biotechnology differs to such an extent that any reasoning (for specific measures) based on this will have difficulties to be accepted among both coalitions. Evidence for or against such are perceived through perceptual filters and are not very accepted by coalitions in the sub-system. There is an actual deadlock between the dispute of basic principles used and methods linked to them.

Notwithstanding, even after decades of research and regulation the dispute over how to use benefits and how to determine unknown risks of biotechnology (from the very beginning of the technologies' development) prevailed in at least its agricultural application (Séralini et al., 2011). New information was gathered, but did not affect beliefs, rather underlined them or affected strategies and here and there led to some policy creation (perceptual filtering).

The principles used for decision-making on GMOs, namely the substantial equivalence and the precautionary principle, can both be seen as representing two policy core attributes. Each is presented by one AC and both have had their involvement in procedures. However, the substantial equivalence aspect remains in practice and in dispute until today even though the precautionary approach is the guiding principle (for treating uncertainties) in legislation. With regard to this the substantial equivalence principle can be understood as indicator for the utopian belief to be dominating the development of the sub-system. Existing structures can be seen to strongly support a positive frame to the development of GMOs.

The EC is laying down the rationale base for a precautionary approach. It also influenced the development of the core methods for policy and safety measures in order to proceed with research. The dominating belief was thus to accept a certain degree of risks to enhance knowledge on benefits. This is also base to the political sub-system which is institutionalized during the Iron Lady Period. With an increased focus on application and commercialization 'chances' the positive frame towards research dominated the initiation of the political sub-system. This relates to Sabatier's forth hypothesis.

Practice enabling safety measures and technical approaches were at the core of policy, while at the same time research and science became more entangled with economic interests. Though the EC remains in a strong position, the methods to deal with uncertainties remain as core to the dispute among coalitions. Due to the low consent within the EC on how to proceed, the AC's grew stronger in their divisions of beliefs. A dispute on beliefs developed on towards a dispute about suitable measures and methods and their rational grounds. From here on the

dispute also involved reputation and prestige of rationality (natural science over social sciences) within governance structures (policy, science, market, civic society).

The Iron lady period as such presents the beginning of advocacy coalitions. Actors divided during this time into lobby groups, either pro or contra biotechnology according to the ACF. Also resources shifted when private funds and interest increased. This can be seen as an external system wide change during the Iron Lady period impacting internal changes (personnel and resources). Applied science facilities and industrial research increased and scientists got closer links to industries or corporations. This also supported a focus on potential benefits of the technology during research.

When first successes were made in the development of genetically engineered plants, presenting new procedures and applications and promising higher yields, improved characteristics of plants and food products and more, the agricultural industry entered the scene. Even the OECD joined to give its vision a voice in political strategies of countries and created measures for safety assessments, determining a technical approach as sufficient. Perceived application and profit chances with GMOs increased, biotechnology corporations formed and organized to also influence policy strategy in their favour (interest and beliefs). The group efforts to influence policy with a utopian belief (proponents) grew as industrial interests developed.

Opponents also gained in actors because as agricultural and food sectors got involved environmental and health concerns rose. Environmental and health organizations thus joined the dispute to influence policy strategies on GMOs. The increased application possibilities also affected farming practices. The policies on GMOs affected more actors who had thus more incentive to join discussions as they were now also involved and affected by implications of products derived of genetic engineering. Besides NGO's mostly related to environmental interests also consumers' and farmers' organisations got involved. Also the European Parliament (EP) got involved supporting a precautionary proceeding.

GMO producers however, got motivated to gather their strength and sue the EU for hindering the free market with its unreasonable precautionary stand towards GMOs. This included the WTO as external actor, also impacting the frame for policy creation of the EU. Visions focusing on the prospects of GMOs were strongly promoting technical measures to

manage commercialization of genetically derived products in order to keep implied costs low and stimulate research and markets.

Today, also the food, feed and drink sector of Europe (suppliers and manufactures) have stakes within the dispute and thus are part of the proponents. They fear higher prices if stringent measures are put in place against GMO traces in imports. On the opposing camp women's organizations joined the table due to negative socio-economic affects of implemented farming practices related to GMOs in especially 'Southern' Countries.

Farmers have clarified their positions by dividing themselves into camps of either promoting industrial agriculture (proponents) or against this to promote traditional, biological and conventional farming practices (opponents). This split of farmers only occurred after the first problems of co-existence occurred and GMOs potentials and remedies were seen to especially flourish in large-scale productions. Some farmer groups thus got protective of own practices and 'joined' environmentalists in their fight against large-scale production, decreasing prices of agricultural products and also against GMOs.

Stimulated by effects of pollution (acid rain, smock, nuclear disaster) green politics were on the rise and so was a sceptical public attitude towards industrial and technological development and its negative effects on nature and people (health). The impact of the Chernobyl disaster on public concerns about the negative side affects of technologies is actually a policy unrelated event, however, this nuclear accident can be understood to have stimulated system-wide changes not only regarding concerns of actors but also regarding policy-making in general. Therefore this can be seen as one of the external perturbations impacting general public concerns and policy shifts. Hence, indirectly this event also impacted the policy domain of biotechnology. A change of parties of various member states and within the European Parliament shifted the focus towards criteria supporting a more precautionary approach. As a result corporations were making losses and the Moratorium of member states following their public's 'fears' closed off EU markets to commercial interest. This political reaction was in favour of opponents. External perturbations led to internal changes strengthening the dystopian belief. The generally dominating utopian belief for a moment lost its 'power' over the sub-system.

As the dispute became bigger, presenting ever more controversies with possible effects on consumers, the press jumped at the topic. Some supermarket chains responded to increasing

consumer concerns and excluded GM products from their shelves. With increased public interest also political (regional, national and EU level) interest increased. The disputing beliefs on GMOs can therefore also be found within various programs of parties. Party policy is an important aspect influencing change of actors (system wide) in advocacy coalitions.

The transparency of and the access to the decision-making construct also enhanced because of tools like the internet, amplifying information exchange and connectivity of actors. The internet with its socio-economic change impacted this political sub-system, its actors and their evidence battles. Through the internet people are for example able to draw linkages between established outcomes and involved interests, much faster than ever before. This is the same for political conflicts and also scientific results. All is scrutinized by everyone with interest, time and internet access. There is a block on almost every topic you can think of where people exchange their views and experiences. Scientific results are scattered apart into pieces to underline 'own' views to reality. To make your point you gather data which supports it. This 'cherry picking' carries a lot of room for errors (Paul Nurse: Science under attack). However, it does contribute to more inclusive discussions and raising of questions.

The internet is presenting to be a fast tool to develop own opinions even to some degree on expert topics. In risk management we do not understand all aspects, and thus rely on the opinion of experts. However a specific procedure and the communication of such can either produce trust in conclusions or destroy it. The invisibility of policy creation on risk assessment and management is therefore related to creating public attitudes concerning governmental and scientific 'conclusions' on GMOs. The public is and remains also within multi-level governance structures an important player influencing policy change and cannot be neglected.

Public concerns prevail and can be understood as a sign that implemented risk assessment and management methods and procedures are not full-filling their tasks to a satisfying degree (low degree of legitimacy). In the eyes of Madame Le Page (MEP) trust in the general democratic processes has to be ensured and for this existing risk assessments and management need to be in existence. Le Page underlines that the system needs to involve a plurality of scientific perceptions within the risk assessments. This plurality should include different views on basic principles like the precautionary approach, the understanding of special risks and the safety of the technology. This would increase the variety of experts to study and question involved risks from various angles. The more different views involved the more likely they would include

various possible concerns and rationalizations. This should increase general capabilities to produce 'rational' and democratic policies (Le Page, EP panel discussion in 2012).

In practice consumer attitudes have already led corporations and their GMO business to move away from European markets. Though international pressure was able to talk about discrimination on markets and so forth, it is the consumer, the public, who can actually discriminate by choosing certain products over others. It becomes obvious how important labelling measures are to actually give this power to consumers. The legislations established are in favour of a precautionary approach. The results and their implementation however, are strongly weakened by the pro camp. Strength and actual dominance of one AC over the other varies among different European regions. This means that on EU level legislation has to be 'all' inclusive in order to offer enough legal grounds and policy scope for member states to act according to their publics' interest without breaching trade agreements or hinder the free choice of either producers or consumers.

All these aspects relate to the fifth hypothesis of Sabatier: *'The policy core attributes of a governmental action program are unlikely to be changed in the absence of significant perturbations external to the subsystem, i.e., changes in socio-economic conditions, public opinion, system-wide governing coalitions, or policy outputs from other subsystems.*'. In accordance with this the Iron Lady period shows a system-wide change on governing coalitions which changed resources and actors' constellation. The green period is influenced by public opinion, party policies, and even policy outputs from other subsystem such as the nuclear domain. A general shift towards increased environmental and health concerns relating to technological developments and processes grew, leading to a temporary shift of dominating belief within the policy sub-system.

After this hit against utopian visionaries international pressures from institutions, governments, and corporations propagated the economic and market oriented opportunities and warned against missing out on these chances which would be costs to the economic prosperity of Europe. This strong economic prosperity link can be seen as the generally dominating utopian belief supported by external perturbation occurring through system-wide and global political changes (changing actors and resource relations). Also the economic crisis can be seen as a stimulus to perceive chances within the technology rather than risks. The new

millennium presents thus with strong incentives to stimulate GMOs and to influence the attitudes of the public, through more discussions, openness, trust and measure building.

Another effect stimulated the involvement of more actors, besides the policy-party shift towards economic or environmental concerns, namely revisions of the EU governance structures due to a legitimacy crisis of decision-making structures and procedures. These revisions lead towards increased public involvement and enhanced powers given to the parliament. These system-wide changes impacted also actors involved within the sub-system on biotechnology. Thanks to both, policies created some more measures to give public some influence as consumer (labelling policies, information) and as political actor on regional, national and European level.

Both approaches, the EC and also to some lesser extent the ACF include an importance of (expert) knowledge and information as resource to decision-making. The EC however, stays rather limited in that it gives no clear division of what to consider as consent and what variables or indicators to look at.

However, it becomes clear that consent within the EC is low from the very beginning of biotechnology on. As internal consent about how to treat involved uncertainties decreases the dominance of the EC to influence policy outcomes becomes weaker. Therefore also the importance of the EC when analyzing policy change decreases. If the EC is not in consensus on how to proceed best, it cannot present 'clear' knowledge as input to policy-making. Thus the involved uncertainties create space for 'other' beliefs to influence perceptions and strategies. The strength of the EC to influence the policy domain is weakened according to Haas' concept and today other actors and arguments have more 'playing' room in discussions on how to deal with uncertainties.

This low consent among the EC makes it necessary to use the ACF because this framework also includes other actors as important players. The advocacy coalitions only developed around the splitting of beliefs of involved scientists. The wider the scope of the technology and its uncertainties, the involved interests, actors and societal spheres, the stronger the beliefs and strategies split.

Despite the fact that together the ACF and the EC form a fairly encompassing frame, certain aspects are not included in either. Knowledge, as pointed out, is an important in-put to policy

and as such is also considered within both frames. However, knowledge is not infinite. This is linked to the concept of bounded rationality. Information to create knowledge and decisions is seen to be limited by various aspects, like time and access, but also perceptual filters, beliefs and strategic use. Nevertheless these important implications regarding power over knowledge are not directly considered within both frames. The dependencies of those creating knowledge and thus the power relations impacting the creation of knowledge are left out in both approaches. Despite the fact that Plato, Aristotle, Socrates, Foucault, Habermas, Flyvbjerg and many more already taught us about implications of power over ratio.

CHAPTER 5: CONCLUSION

The history of the policy subsystem of GMOs in general makes clear that the dispute surrounding GMOs is a long-lasting one. This is one of the prerequisites of Sabatier to use the ACF for analysis of policy change. In his first hypothesis he claims that when policy core beliefs are in dispute, the line-up of allies and opponents will remain stable over time. In the GMO subsystem one can see that two main colliding beliefs have been at its core for over three decades. These utopian and dystopian visions are represented by two opposing coalitions. The actors within these coalitions have – as contradictory as it may sound – remained stable, *and* changed. They have remained stable in the sense that actors once part of an AC, have kept their allegiance towards this AC. At the same time as the fields influenced by GMOs (chances and risks) increased, new actors joined the advocacy coalitions on both sides shifting the constellations of actors (see Appendix: Time Period Tables 1-5).

Sabatier furthermore claims that this 'stability' will be maintained for approximately a decade. Appendix 1 clearly shows that each period spans approximately a period of ten years except for first of all the Science Period which is better suited for analysis by employing the concept of the EC due to the lack of ACs. The second exception is the Moratorium Period, which only spans a period of four years. This seems to thus be in contradiction with Sabatier's claim. However, it is more than logical to view the Moratorium Period as a policy response to and thus an extension of the Green Period. In conclusion, Sabatier's first hypothesis is confirmed for this policy subsystem.

In his fourth and fifth hypotheses Sabatier states that policy will remain stable, or consistent, unless a change is imposed by a hierarchically superior jurisdiction (hypothesis 4) or due to the occurrence of significant perturbations external to the subsystem (hypothesis 5). Within the dispute on GMOs, policy change occurs when one period ends and the next one begins. During the periods policies stay rather stable. This becomes evident when looking at the policy changes within and between the different time periods. From the analysis it becomes apparent that statements about hypothesis 4 cannot be made. None of the periods show evidence of a hierarchically superior jurisdiction imposing their will onto the policy sub-system. The only events that could be considered as such are the WTO court case and the 'de facto' moratorium. The WTO court case against the Moratorium provides insufficient evidence,

because the hierarchy of the WTO and EU jurisdictions is disputed among experts. Nevertheless, the WTO court case could provide an extra incentive for policy change by providing 'rationalization' grounds for proponents.

In the case of the 'de facto' moratorium hierarchically superior jurisdiction is questionable. The moratorium was imposed by some member states of the EU. This points to the fact that member states in this case asserted their national 'superior' jurisdictions over EU decisions. But member states would not have been able to impose policy change, had it not been for the external perturbations such as increased influence of public opinion, during the Green Period. Closely linked to this is the fact that the Moratorium Period can be seen as an extension of the Green Period. Only if national ACs influence national policy changes can member states influence European policy change. This framework does not present enough insight to argue that this could be either seen as a superior jurisdiction or an external perturbation. Hypothesis 4 thus remains inconclusive.

The period tables present policy changes and during the various time periods also external perturbations stimulating these changes exist. These external impacts can be seen to have lead to either a change of resources or a change of actors' constellations within ACs influencing policy outcomes. The Iron Lady shows resource related impacts on ACs. These stimulated the positive frame towards GMOs. The Green Period shows external events which increased public concerns, party-policy changes from national to European levels, and changes to European governance structures enhancing the involvement of the public. These external perturbations gave strength to the opposing camp leading to the 'de facto' Moratorium (among other policy changes). After this the Millennium Period presents a back-and-forth movement of policy regarding either the one or the other belief within various overlaying sub-systems. The economic crisis can be seen to stimulate a positive frame to the chances and benefits of biotechnology and so too of GMOs. Thus the hypothesis that external events are preconditions for policy change can be confirmed.

Another aspect seen to create policy change is a change of beliefs through learning. However, ACs do not show a change of beliefs when involved in disputes concerning GMOs. Learning across coalitions does not seem to occur. Hence, learning as a stimulus to policy change remains limited until today. Actors still fall into rhetoric fights over what constitutes the 'truth'. Chances of learning are minimal. Change however, is steadily occurring. The decision-making institutions are changing and their responsibilities are broadening. The ability of an actor

of one AC to even comprehend the beliefs and argumentations of the 'other' AC is limited. Actual learning among coalitions is even less likely to occur, also with regard to perceptual filtering. Learning among coalitions could have lead to changes of policy. However, changes of policy occurred mainly because of strategic or practicality moves, because core beliefs and argumentation stay the same. Learning has a less than significant impact on policy change regarding GMOs when perceptual filtering takes place. Hence, the revisions to the ACF to emphasize the importance of external perturbations besides learning as impacting policy change were significant revisions.

The research presents the result that policies have been changed and that beliefs have not. This means that there is no direct relation between changes in policy and changes in beliefs. However, the balance of support of disputing beliefs has varied between time periods. One of the ACs was able to dominate policy outcomes with own beliefs over the other, and visa versa. Even though beliefs did not change their reciprocal weight ratio did. This was impacted mostly by external perturbations affecting constellations and resources of actors in advocacy coalitions.

Involving the EC turned out to be less useful than thought. Nevertheless, for the nascent sub-system this concept provides a good alternative. A sub-system according to Sabatier's revised framework can emerge out of a new issue which in this case is steered by the scientific community (Sabatier, 1999:136). The EC is a good concept but should especially be used in cases where the consent among the epistemic community is high. In other cases policy change analysis requires the use of the ACF, because this model encompasses other actors besides the scientific community. Nevertheless, the EC and their rationalization methods are impacting governing rationalities and therefore also the methods to involve disputing beliefs and in general the development of the policy sub-system.

The ACF turns out to be indeed a suitable frame to analyze policy change in the European GMO policy domain. The revisions of the framework were necessary as the studied case shows. To remember, revisions of the ACF by Sabatier mainly refer to an increased importance of external perturbations besides learning among and within coalitions as preconditions to major policy change. Also in the policy sub-system of GMOs this importance of external perturbations for policy change is mirrored.

The disputes on understanding and administering potential benefits and risks of GMOs within the political sub-system furthermore underline that beliefs are an important aspect when

considering policy change. Not so much in the sense to detect policy changes or explain it but rather to understand the core disputes, enhance dialogue, and increase chances towards learning across coalitions. This study has shown that the dispute cannot be solved due to colliding core beliefs. Views and the understanding of the problems at hand have always been looked up on differently and this difference will most likely remain.

The ACF should however be extended to provide more indicators for determining the dominance of an AC. In general though this approach includes various actor groups and their beliefs as input to decision-making and therefore appears suitable to study increasing complexities within political decision-making in the realm of a globalizing world. The different governing levels can be separated. Also here it is up to the researcher to develop suitable differentiations between various sub-systems and involved governmental levels which can present tricky challenges such as with the WTO case and the 'de facto' moratorium.

Finally, to improve the understanding of policy change and dispute solving it is necessary to implement aspects linked to cultural thought and change, for example, religion, the internet and consequently a faster exchange of views and information, faster opinion building and more democratic participation, and more facilitated transparency towards and participation of the public. Politicians, their interest and dependencies and decisions are more transparent and so are the preferences of their voters to them. With regards to this the importance of party-policy and politicians following the interest of citizens can be seen as playing an important role in influencing policy change once again. Generally, power over governing rationalities should never be neglected.

EPILOGUE

Like the church, like the king, like the expert; policies ARE created in the realm of existing power and ratio 'structure', within established numbers and categories (even in our contemporary democracies).

The policy sub-system and its policy outcomes become a "[…] kind of social contract that specifies the terms under which state and society agree to accept the costs, risks and benefits of a given technological enterprise." (Jasanoff, 1995:311). Policies on GMOs try to establish a variety of measures and principles with which to 'manage' the development of GMOs in an acceptable and legitimate 'way'. However, the implementation of such varies as actors and strength of coalitions vary among regions.

We can see that reality is 'socially constructed' and in some part can be influenced by experts (Haas, 1992:21). Highly technical disputes have to include an epistemic community. This community influences information and therefore our understanding of the dispute. Nevertheless, it is on each of us to decide on how to treat uncertainties, and to ask about the purpose and the role of technology (considering societal and environmental impacts). The question of what society we want to live in and can live in becomes more important in discussions and policies today (facing global warming). There is a growing community or maybe better inter-disciplinary and trans-disciplinary advocacy coalition sharing the belief that there is an urgency to act and change the focus of science, markets, policies and societies in general. Away from product and profit orientation towards sustainability. Various actors come together to transform processes step for step. This is visible in many areas of society and also within the dispute on GMOs. For example through the occupy movement, but also projects like NaWis (network supporting science towards sustainable purposes) which underline considerations of broadening concerns and expertise to be included within existing structures for science but also financial sectors and so forth.

All in all governmental rationalities steer those who govern or at least influencing those who govern. The rational base to all assumptions and strategies impacts the whole political-subsystem and the policy outcomes. One could say that this dominating ratio even draws the

boarders separating the enlightened bits of reality which are accepted from those which do not suite and are laying in the dark.

Those who want to influence the system with 'other' rationalities have to find the language to communicate and slowly build-up the rational frames which support own strategies and logic. As long as implemented governmental rationalities supersede any other views, there will be no understanding and acceptance of such new and different insights. They simply would not fit the rational at work and therefore would not fall within the enlightened bit of accepted realities. In the dispute about GMOs colliding beliefs are obvious. Now, it seems to all be about the openness of actors to understand, learn, act accordingly and institutionalize change.

I thank the civic society for increased participation demands, because it is important that people keep influencing policies with their concerns for health and the environment against profit oriented marketing. It is sad to see though that financial interests are still a shadow over 'other' purpose oriented science (e.g. sustainability) which lack sufficient resources. Nevertheless, I belief that the internet can play an even bigger part in creating inter-disciplinary and trans-disciplinary 'purpose oriented ethical' science. How this could look in practice is a whole new dispute. Nevertheless, all evidence leads to the conclusion that people do not really need GMOs, that they cannot solve hunger problems, but instead that they promote monocultures and industrial practices and therefore corporations rather than small-scale farmers. Peru has thus implemented a ten year ban on GM crops and animals (CapitalFM News, 5 Novermber 2011). Also Poland is implementing a ban against Monsanto's genetically enhanced corn variation (Bt corn) (Natural News, 7 April 2012; Care2 News, 8 April 2012).

Therefore one can say that even globally there is an increasing support of the precautionary method and the dystopian vision linked to biotechnology. Europe's opposing AC is part of a growing global advocacy coalition lobbying against GMOs. Involved uncertainties leave space for the involvement of 'other' argumentations besides merely technical reasoning. Generally civic society though does not perceive benefits of GMOs (at least non to people or the environment) and therefore in the long-run nor governments nor scientists can deny the 'feelings' and experiences of the public pointing to risks towards the environment and people. Yet, the scepticism of the public seems to be overcoming step-by-step the economic aspirations perceived by proponents.

APPENDIX

1.1 TIME PERIOD TABLES

Science Period (1974-1979)

Coalition	*Actors*	*Beliefs*	*Policy Changes*
A	Scientists Researchers	Utopian	Safety measures to proceed with research
B	Scientists Researchers	Dystopian	Berg letter and Asilomar: Call for regulation, safety measures and until then a ban on research and release

Time Period Table 1

Iron Lady Period (1979-1989)

Coalition	*Actors*	*Beliefs*	*Policy Changes*
A	Scientists Researchers Applied science – industrial research Agricultural Industry OECD	Utopian	Binks Report (to exploit research for commercialization) Council Recommendation 82/472 (deeming existing measures as sufficient, weakening the importance of necessity to include 'other' concerns) Blue Book
B	Scientists Researchers Health and safety bodies Environmental groups	Dystopian	

Time Period Table 2

Green Period (1989-1999)

Coalition	*Actors*	*Beliefs*	*Policy Changes*
A	Scientists Applied science (of various research facilities) Biotechnology corporations Agricultural Industry	Utopian	Bergman Report Regulation No.258/97
B	Scientists Researchers Farmers Consumers --Public Health and safety bodies Environmental groups NGO's Green parties EP DGXI Some MS Press Supermarket chains	Dystopian	Viehoff Report (1987) Bergman Report Directive 90/219/EC Directive 90/220/EC Maastricht Treaty (1992/93) Rio Declaration / Agenda 21 (1992)

Time Period Table 3

Moratorium Period (1999-2003)

Coalition	*Actors*	*Beliefs*	*Policy Changes*
A	Scientists Applied science (of various research facilities) Biotechnology corporations Agricultural Industry WTO / OECD	Utopian	2001/18/EC (Substantial Equivalence Principle) WTO Ruling
B	Austria, Denmark, France, Greece, Italy, Luxembourg EP	Dystopian	`De Facto´ Moratorium 2001/18/EC (Precautionary Principle)

Time Period Table 4

Millennium Period (2002-2012)

Coalition	*Actors*	*Beliefs*	*Policy Changes*
A	Scientists Applied science (of various research facilities) Biotechnology corporations Agricultural Industry Commission WTO / OECD Major market players (e.g. import of soy, animal food and feed) Food and feed and drink sector of Europe (including suppliers and manufactures)	Utopian	Biotechnology as important 'aspect' of innovation and societal development in policy strategy (IFS) EFSA (expert body) 9% contamination levels
B	Public – Consumers Women's organizations Farmers' organisations Farmers (traditional, bio, conventional and not in favour for increased industrialization of processes)	Dystopian	2003 Legislation (consumer concerns included through labelling measures etc.) Honey ruling Alert system for food and feed imports on EU borders Public order as new legal ground? Open access to data

Time Period Table 5

All Time Periods

Time Period	I Science	II Iron Lady	III Green	IV Moratorium	V Millennium
AC	2	2	2	2	2
Actors	(small group of) Researchers and Scientists	Researchers/ Scientists + Industry	Scientists, Industry, + Geologists, ecologists and public	Scientists, Industry, Environmentalists, Public, + Policy parties	Scientists, Industry, Environmentalists, Public, Policy parties, + Producer and Consumer + Civic society organisations, grass-root initiatives
Event	Internal	External and Internal	External and Internal	External and Internal	External and Internal
EC	High consent	Shift of interest focus	Diverging consent	Diverging consent	Diverging consent
Legislation	Moratorium; Followed by research enabling guidelines; International Guidelines; sector level legislation; Berg letter '74; Asilomar Conference safeguard measures	Budgets; Market mechanisms and incentives; Spinks Report '80; Rec 82/472; Blue Book '86;	Safeguard clause; Increase of environmental laws; Viehoff Report '87; Bergman Report '91; Maastricht Treaty '92; Rio Declaration '92; Reg.258/97EC	Moratorium; 2001/18/EC (labelling, traceability); WTO ruling 2006	Innovation Strategy; Precautionary and substantial equivalence; EFSA; (Environmental) Risk assessment (RA and ERA, based on subst. eq. principle); 2003 Legislation; Labelling, traceability, free choice and measures enhancing public acceptance; Contamination levels
Perceptions and beliefs	Before continuing with research, risk levels need to be more clarified; Call for regulation, Safety measures are needed (research and lab oriented); Need to increase data (more research); Opportunity VS Nescience	Commercial value of research; Application; Competition; Economic values; Importance VS acceptable risks	Special risk of technology (towards humans, nature and biodiversity); Precautionary measures	Ban; Clearer methods	Product risks; Special risks; Benefits; Innovation Post-market monitoring; Co-existence, ERA guidelines; Deliberate models; Honey ruling; Data exchange increased Proxy issue (globalization, industrialization

Concerns	Exposure to humans (researcher), lab and surrounding citizens; Possible risks to nature; Usage as weapon; Nescience	Competitiveness; Socio-economic; Social; Ethical	Social; Ethical; Environmental; Health; Competition (RTD); Lack of knowledge of actual risks; Food safety; Sustainability and Biodiveristy; Increased activism '98	Legitimacy deficit; Competitiveness; Public votes; Sustainability and Biodiveristy; Antibiotic resistant genes (ARM genes); Legal grounds VS WTO; Democracy/Legitimacy VS Competition	Credibility of science, Conflicting interests; Patents, confidentiality rights and data access; Corporate concentration; ERA: Procedures, accuracy of input to models, quality of science and presented conclusions, vague definitions, not replicable, reliable, need for all inclusive categories and variables; Too complex methods; Too high burden on industry; Socio-economic; Co-existence; Contamination of crops, seeds and products; Sustainability; Free choice limited? Ban the only way to protect biodiversity in crops variations and wildlife? Competitiveness; Challenges of global changes; Pest and pesticide resistance; ARM genes; Liability; Conflicting interests of decision-makers; Scientific reliability; Increased activism, online participation and lobbying; Empirical data VS Benefits; Substantial equivalence VS Trans-disciplinary and interdisciplinary understandings
Philosophy/ Principle	Aware of uncertainties; Science will provide with insides to decrease uncertainties and determine risks; Regulation is necessary	Aware of uncertainties; Science will provide with insides to decrease uncertainties and determine procedures to cope with uncertainties	Product orientation; Technical approach to risk assessment; Precaution VS Benefits	Process orientation; Public acceptance;	Free choice; Increased data to cope with uncertainties, risk assessment and management, Benefits Process VS. product orientation Comparative VS. special approach Special RA of technology VS.

		Acceptable degree of virtual risks due to high benefits			product related RA
Myth of nature[5]	*Nature perverse/tolerant*	*Nature perverse/tolerant and nature benign*	*Nature perverse/tolerant?*	*Nature ephemeral*	*Nature ephemeral VS. Nature perverse/tolerant*
Strategy/ Management	Interventionist	Interventionist and Lassez-faire	Interventionist, Lassez-faire, and Precautionary	Precautionary	Precautionary and Interventionist
Risk Framing	Virtual	Virtual	Virtual	Virtual	Virtual VS. Scientific risk
Goal	Knowledge	Research	Research	Democracy	Democracy, Research, Knowledge

Time Period Table 6

[5] Myth of nature:
Nature bening: nature is predictable, stable, and forgiving of impacts of humankind;
Nature ephemeral: nature is fragile, precarious, and unforgiving;
Nature perverse/tolerant: a combination of both, nature is predictable but not totally forgiving;
Nature capricious: nature is unpredictable.
For more inside see: Burchell, 1998, pp.15-16; Adams, 1995, pp.34-36; Thompson, Ellis & Wildavsky, 1990.

1.2 OTHER

Box: Dispute over conclusions presented within commission's folder at panel discussion EP 2012

- The conclusion presented within the folder of the Commission was also underlined and read out loud to the audience by a representative of *Pioneer*.
- A spokes women from *Greenpeace* replied on a later possibility that the research sources given in the folder of the commission are all product related and do not focus on the actual impacts of (agriculture) processes of biotechnology. Many parts refer to the importance of communication with consumers and thus are about strategies on how to better sell biotechnology products, she sais. She went on in criticizing the commission to publish this and questions the methods and studies included leading to a conclusion that GMOs are safe.
- *A* representative of *Europabio* refers to the 'fact' that there were no significant accidents in 15 years of commercialization and that any other technology would consider it-self lucky to be as safe as biotechnology. He pointing out that GM products are found to be safe or even safer than conventional counterparts. Industry furthermore underlines their interested in their product's safety because of consumers and liability aspects.
- Per Bergman (head of GM unit) pointed out that research of the last 25 years concludes that genetically engineered products are safe as their 'natural' counterparts, however, not without risks.
- G. Lyon, a Liberal MEP, said that only talking about risks seems like one wants to exclude any and all risk, which is not possible in any part of reality. He went on in pointing out that than we would have to ban all technologies.

Endnotes

After a presentation of an organization criticising the actual numbers of seed controls performed in a year and a strong lack of transparency of those, the Minister for Environment, Health and Consumer protection of Brandenburg responded that there just is no money and that the team is just too small to cope with any more controls, the request made by 'Buendnis fuer Brandenburg' was implied to be ridicules. I pointed out that by increasing information access and transparency of such reports the involvement of the public might bear a chance to create enough pressure for a better budget for seed controls. I asked, why they do not try to work on this together instead of against one another. The Minister laughed, and said that I am much too short on this planet to understand how policies work, and that there just is no money. In a later conversation we agreed on some points and he actually admitted that he went into politics (former scientist) to better be able to influence change. It becomes obvious how important the motivation and the perceived chances to impact change are for actors within the policy structures. Without such, there cannot be any open dialogue. Communication reflects merely a top-down approach of who is the one with more 'prestige' knowledge and experience.

RESOURCES

Journals and Reports:

Abels, Gabriele, (2002) 'Experts, Citizens, and Eurocrats – Towards a Policy Shift in the Governance of Biopolitics in the EU', Faculty of Sociology, University of Bielefeld, European Integration online Papers (EIoP), Vol. 6, No.19. Online version retrieved on 12 Oktober 2011, from: http://eiop.or.at/eiop/texte/2002-019a.htm;

Adams, J. & Thompson, M., (2002). 'Taking account of societal concerns about risk; Framing the problem', Health and Safety Executive Research Report 035, HSE Books, UK, pp.1-53.

Adcock, M. (2006). 'EU Legislation on Genetically Modified Organisms'. Online version retrieved on 22 October 2011, from:
http://www.biotethics.org/downloads/articles/EU%20Legislation%20GMOs.pdf.

Bandelow, Nils (2006). 'Advocacy Coalitions, Policy-Oriented Learning and Long-Term Change in Genetic Engineering Policy: An Interpretist View', German Policy Studies, TU Braunschweig, Vol.3, No.4, pp.747-805.

Berg Letter, (1974). "Potential biohazards of recombinant DNA molecules," Science, 185:303. Online information and interview available on:
http://content.cdlib.org/view?docId=kt1c6001df;NAAN=13030&doc.view=frames&chunk.id=d0e4427&toc.id=d0e4360&brand=calisphere

Berg et al., (1975). 'Summary Statement of the Asilomar Conference on Recombinant DNA Molecules', Proc. Nat. Acad. Sci. USA, Vol. 72, No. 6, pp. 1981-1984, Online version available on: http://authors.library.caltech.edu/11971/1/BERpnas75.pdf

Bergmans, H., (2006). 'Basic framework for risk assessment of transgenic plants developed by OECD: history and evolution of OECD's risk/safety assessment framework', power point presentation: 20 years of Blue Book

Bonny, S. (2003). 'Why are most Europeans opposed to GMO's? Factors explaining rejection in France and Europe'. Electronic Journal of Biotechnology, Vol. 6, No. 1. Online version retrieved on 17 November 2011, from:
http://www.ejbiotechnology.info/content/vol6/issue1/full/4/index.html.

Burchell, K., (1998). 'Fractured Environments: Diversity and conflict in perceptions of environmental risk', Environmental and Spatial Analysis, No.52, Departmetn of Geography&Environment, London School of Economics.

Cantley, Mark F., (1995). 'The Regulation of Modern Biotechnology: A Historical and European Perspective. A Case Study in How Societies Cope with New Knowledge in the Last Quarter of the Twentieth Century', Brauer, Dieter (ed.): Legal, Economic and Ethical Dimensions (Biotechnology

– A Multi-Volume Comprehensive Treatise 12). Weinheim et al.: VCH, 505-681.

Dunlop, Claire, (2000). 'GMOs and Regulatory Styles', Environmental Politics, Vol.9, No.2, pp.149-155.

Devos, Y., et al. (2008). 'Ethics in the societal debate on genetically modified organisms: A (re)quest for sense and sensibility'. Journal of Agricultural and Environmental Ethics, No.21, pp.29-61. Online version retrieved on 15 April 2012, from: https://biblio.ugent.be/input/download?func=downloadFile&fileOId=1136828&recordOId=414447.

Gaskell, G., Ten Eyck, T., Jackson, J., Veltri, G., (2005). Imagining nanotechnology: cultural support for technological innovation in Europe and the United States', Public Understanding of Science, Sage publications, 14 (1), pp. 81–90. Online version retrieved on 26 Oktober 2011, from: http://hesa.etui-rehs.org/uk/dossiers/files/gaskell2005.pdf.

Gonzalez, X. (2009). 'The Politics of Genetically Modified Organisms: Global Rules, Local Needs', University of Texas: International Studies, Organizations, and Social Justice.

Gottweis, Herbert, (1998). 'Governing Molecules: The Discursive Politics of Genetic Engineering in Europe and in the United States', Cambridge, MIT Press, pp.153-163.

Gottweis, Herbert. Genetic Engineering, Scientific-Industrial Revolution and Democratic Imagination. Online version retrieved on 12 October 2011, from: http://90.146.8.18/en/archiv_files/19991/E1999_122.pdf.

Greenwood, Justin & Ronit, Karsten, (1992). 'Established and Emergent Sectors. Organized Interersts at the European Level in the Pharmaceutical Industry and the New Biotechnology', Greenwood, Justin/Grote, Jürgen/Ronit, Karsten (ed.): Organized Interest in the European Community. London: Sage, pp.69-98.

Haas, Peter M., (1992). 'Introduction: Epistemic Communities and International Policy Coordination', Knowledge, Power, and International Policy Coordination, International Organization, MIT Press, Vol.46, No.1, pp.1-35.

Hammond, Linda-Darling, et al. (2001). 'How People Learn: Introduction To Learning Theories', Stanford University School of Education, pp.1-22. Online version retrieved on 20 January 2012, from: http://www.stanford.edu/class/ed269/hplintrochapter.pdf.

Hoppe, R. & Peterse, A., (1993). Handling frozen fire. Political culture and risk management. Boulder, CO: Westview Press.

Jasanoff, S. (1995). 'Product, process, or programme: three cultures and the regulation of biotechnology'. In M. Bauer (ed), Resistance to New Technology. Cambridge: Cambridge University Press.

Kesim, H.K. & S. Ayirtman (2006). 'Merits and Limits of Deliberative Public Participation in Multi-Level Governance: The Case of Genetically Modified Foods Regulations in the European Union'. Online version retrieved on 19 December 2011, from: http://paperroom.ipsa.org/papers/paper_5103.pdf.

Krimsky, Sheldon, (1982). 'Genetic Alchemy: The Social History of the Recombinant DNA Controversy.', Cambridge: MIT Press.

Levidow, L. and J. Bijman, (2002). 'Farm Inputs under Pressure from the European Food Industry'. Food Policy, Vol. 27, No. 1, pp. 31-45. Online version retrieved on 3 November 2011, from: http://technology.open.ac.uk/cts/docs/LLJB_FarmInputs_FP%2002.pdf.

Mc Enery, R. (2009), 'Despite Recession, New Funding Stimulates Research'. Vax, Vol. 7, No. 5. Online version retrieved on 7 January 2012, from: http://www.iavi.org/lists/iavipublications/attachments/e3e6c933-d88a-44e7-ba1a-054854159aaa/iavi_vax_may_2009_eng.pdf.

Mitchell, P. (2007). 'Europe's anti-GM stance to presage animal feed shortage', Nature Biotechnology, Vol. 25, No. 10, pp. 1065-1066.

Moltke, Konrad von, (1995). 'The Maastricht Treaty and the Winnipeg Principles on Trade and sustainabile Development', IISD – International Insitute for Sustainable Development, Canada. Online version retrieved on 4 February 2012, from: www.iisd.org/pdf/maastricht.pdf

National Foreign Trade Council Inc., (2003). 'EU Regulation, Standardization and the Precautionary Principle: The Art of Crafting a Three- Dimensional Trade Strategy That Ignores Sound Science', Washington D.C., pp.1-64. Online version retrieved on 1 February 2012, from: http://www.wto.org/english/forums_e/ngo_e/posp47_nftc_eu_reg_final_e.pdf.

Nap, J.P. et al (2003). 'The release of genetically modified crops into the environment, Part I, Overview of current status and regulations'. The Plant Journal, Vol. 33, pp. 1-18. Online version retrieved on 2 November 2011, from: http://foodsafety.k-state.edu/articles/70/gm_crops_enviro_part1.pdf.

Rosendal, G. K., (2005). 'Governing GMOs in the EU: A Deviant Case of Environmental Policy-Making?', Global Environmental Politics, Vol.5, No.1, pp.82-104. Online version retrieved on 20 January 2012, from: http://www.fni.no/doc&pdf/GKR-GEP-2005-1.pdf.

Sabatier, Paul A. (1988). 'An advocacy coalition framework of policy change and the role of policy-oriented learning therein', Policy Sciences, No.21, pp.129-168.

Sabatier, Paul A. & Jenkins-Smith, Hank C., (1993). 'Policy Change and Learning: An Advocacy Coalition Approach'. Boulder, CO: Westview Press.

Sabatier, Paul A., (1998). 'The Advocacy Coalition Framework: Revisions and Relevance for Europe', Journal of European Public Policy, 5/1, pp.98-130.

Séralini, Gilles-Eric, (2011). 'Genetically modified crops safety assessments: present limits and possible improvements', Environmental Sciences Europe, Vol.23, No.1, DOI: 10.1186/2190-4715-23-10.

Skogstadt, G. (2011). 'Constructing a Transnational Policy Paradigm in the European Union: the Case of GMO Risk Regulation'. Online version retrieved on 12 January 2011, from: http://www.cpsa-acsp.ca/papers-2011/Skogstad.pdf.

Tait, J., (2008). 'Risk governance of genetically modified crops— European and American perspectives', Renn O, Walker K, eds. Global Risk Governance: Concept and Practice Using the IRGC Framework. Springer, Dordrecht, Netherlands, pp.133-53.

Vandana Shiva et al. (2011). "The GMO Emperor Has No Clothes" 'A Global Citizens Report on the State of GMOs –False Promises, Failed Technologies', supported by various NGO's and others. Online version retrieved on 15 April 2012, from: http://www.nabu.de/imperia/md/content/nabude/gentechnik/studien/gmo_emperor_study_pdf.pdf.

Wendler, F. (2005). 'The European Food Safety Authority as a Source of "Soft Law": Towards more Effective and Legitimate EU Food Safety Governance? Online version retrieved on 16 January 2012, from: http://www.mzes.uni-mannheim.de/projekte/typo3/site/fileadmin/research%20groups/6/Papers_Soft%20Mode/Wendler.pdf.

Books:

Bergstedt, J., (2010). 'Monsanto auf Deutsch: Die Enzyklopaedie der Gentechnik-Seilschaften', Seitenhieb, Deutschland.

Flyvbjerg, Bent, (1998). 'Rationality & Power; Democracy In Practice', The Univerity of Chicago Press, Chicago and London.

Pringle, Peter, (2003). 'Food, Inc. Mendel to Monsanto – The Promises and perils of the Biotech Harvest', Simon & Schuster Paperbacks, New York.

Glaser, Barney G. and Anselm L. Strauss, (1967). 'The Discovery of Grounded Theory. Strategies for Qualitative Research', Aldine, Chicago.

Lofland, J. and L.H. Lofland, (1995). 'Analyzing Social Settings, A Guide to Qualitative Observation and Analysis.', 4th ed., Thomson Wadsworth.

Sabatier, Paul A., (1999). 'Theories of the Policy Process; Theoratical Lenses on Pubilc Policy', Oxford, Co: Westview Press.

Thompson, M., et all., (1990). 'Cultural Theory', Political Cultures Series, Westview Press, 1st ed.

Weasel, L., (2009). ´Food Fray: Inside The Controversy Over Genetically Modified Food´, AMACOM, New York.

Court, Legislation, Directives and Agreements:

CBD, (1992). Convention on Biological Diveristy, Earth Summit in Rio.
Douglass C. North, December 9, 1993 Prize Lecture to the memory of Alfred Nobel. Online version retrieved on 6 December 2012, from:
http://www.nobelprize.org/nobel_prizes/economics/laureates/1993/north-lecture.html.

Directive 90/219/EEC. Online version available from EUR-LEX:
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1990:117:0001:0014:EN:PDF.

Directive 90/220/EEC. Online version available from EUR-LEX:
http://eur-lex.europa.eu/Result.do?arg0=Directive+90%2F220%2FEEC&arg1=&arg2=&titre=titre&chlang=en&RechType=RECH_mot&idRoot=5&refinecode=LEG*T1%3DV112%3BT2%3D%3BT3%3DV1&Submit=Search.

Directive 2001/18/EC. Online version available from EUR-LEX:
http://eur-lex.europa.eu/smartapi/cgi/sga_doc?smartapi!celexplus!prod!DocNumber&type_doc=Directive&an_doc=2001&nu_doc=18&lg=en.

Viehoff Report EP, 1986/87 SESSION. Online version available from EUR-LEX:
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:1987:076:0001:0033:EN:PDF.

EU (1998). 'European Parliament legislative resolution on the Council common position for adopting a European Parliament and Council directive on the deliberate release into the environment of genetically modified organisms and repealing Council Directive 90/220/EEC (11216/1/1999 – C5-0012/2000 — 1998/0072(COD))'. Online version retrieved on 12 November 2011, from: http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P5-TA-2000-0149+0+DOC+XML+V0//EN.

Federal Court of Canada (2001 FCT 256), 'Monsanto Canada Inc. VS. Percy Schmeiser', FCT, Date:20010329, Docket: T-1593-98. Online version retrieved on 14 April 2012, from:
http://decisions.fct-cf.gc.ca/en/2001/2001fct256/2001fct256.html.

Karl Heinz Bablok and Others v Freistaat Bayern, Judgment of the Court (Grand Chamber) of 6 September 2011. Online version retrieved on 12 January 2012, from: http://curia.europa.eu/juris/celex.jsf?celex=62009CJ0442&lang1=en&lang2=DE&type=NOT&ancre.

Maastricht Treaty, (1992). Online version available from EUR-LEX:
http://eur-lex.europa.eu/en/treaties/dat/11992M/htm/11992M.html.

Regulation No. 258/97

Recommendation 82/472

Rio Declaration: Definition of the Precautionary approach, p.21. Online Version retrieved from: http://www.unep.org/Documents.multilingual/Default.asp?DocumentID=78&ArticleID=1163.

Events:

Panel Discussion on 17 March 2011. 'Meeting on Genetical Modified Organism Risk Assessment', Health and Consumer DG, online streaming on: http://scic.ec.europa.eu/str/index.php?sessionno=4cb811134b9d39fc3104bd06ce75abad.

Bt-Maiz Anbau in Brandenburg 21 June 2011 (Berlin); organized by NABU. Online information available on: http://www.nabu.de/themen/gentechnik/hintergrund/13785.html.

Press Conference, 7 December 2011. Vandana Shiva and Renate Kunast at NABU, 'The GMO Emperor Has No Clothes', online article: http://www.nabu.de/themen/gentechnik/studien/14404.html.

NAWIS (Nachhaltige Wissenschaft), 3 July 2011. Online information available on: http://nachhaltigewissenschaft.blog.de/2011/07/03/verbund-nachhaltige-wissenschaft-nawis-netzwerk-staerkung-nachhaltigkeitswissenschaften-wissenschaftssystem-11415503/.

Documentaries:

'Science under attack', (2011). BBC. Paul Nurse (head of Royal Society). Online version available on: http://www.bbc.co.uk/programmes/b00y4yql.

'The Future of Food', (2009). Vandana Shiva. http://wn.com/Vandana_Shiva_Interview.

Online Articles, news and other sources:

CapitalFM News, 5 Novermber 2011, 'Peru's Congress approves 10-year GMO ban'. Website: http://www.capitalfm.co.ke/news/2011/11/perus-congress-approves-10-year-gmo-ban/.

Carlson, R.H. (2010), Biology is Technology: The promise, peril, and new business of engineering life. Massachusetts: Harvard University Press, p. 155.

Care2 News, 8 April 2012. 'Poland is Latest Nation to Ban Monsanto's GMO Maiz'. Online version retrieved on 19 April 2012, from: http://www.care2.com/causes/poland-is-latest-nation-to-ban-monsantos-gmo-maize.html.

EurActiv News, 22 November 2006. 'EU Akzeptiert WTO-Urteil ueber GMO'. Online version retrieved on 12 October 2011, from: http://www.euractiv.com/node/251001.

EurActiv News, 04 February 2011. 'EU-Entwurf: Staaten können auf Grund von öffentlicher Ordnung GM-Anbau verbieten'. Online version retrieved on 12 October 2011, from: http://www.euractiv.com/node/501924.

EurActiv News, 23 February 2011. 'EU experts approve trace GM in feed imports: Official'. Online version retrieved on 12 October 2011, from: http://www.euractiv.com/cap/eu-experts-approve-trace-gm-feed-imports-official-news-502442.

EURActiv News, 25 January 2012. 'Disgruntled GMO firms start pulling out of EU market'. Online version retrieved on 15 May 2012, from: http://www.euractiv.com/de/node/510378.

Friends of the Earth (2008), 'Campaigners' Briefing: Animal feed crisis and EU GMO laws – is there a link?' Website: http://www.foeeurope.org/GMOs/ZERO_TOLERANCE_Campaigner_briefing_FINAL.pdf. 11th November 2011.

Friends of the Earth (2010). 'The socio-economic costs of GMO's: Hidden costs for the foodchain'. Online version retrieved on 9 November 2011, from: http://www.bund.net/fileadmin/bundnet/pdfs/gentechnik/20111117_gentechnik_socio_economic_impacts_foee_briefing.pdf.

Greenpeace Press Release, 8th November 1996. 'Greenpeace Blocks Shipment of Genetically Engineered Soya, Day 2'. Online version retrieved on 17 June 2011, from: http://archive.greenpeace.org/comms/cbio/prgnov08.html.

Greenpeace (2007). 'Der Fall Gen-Mais MON863: Chronologie einer systematischen Täuschung'. Online version retrieved on 2 December 2011, from: http://www.greenpeace.de/fileadmin/gpd/user_upload/themen/gentechnik/greenpeace_chronologieMON863.pdf.

Natural News, 7 April 2012. Video on: 'Poland Announces Complete Ban on Monsanto GMO Maiz'. Online retrieved on 19 April 2012, from: http://tv.naturalnews.com/v.asp?v=92DE1E4A1C3F75A89B9975A6C0A738C0.

New Scientist, 3 July 1980. Article by Stephanie Yanchinski, 'Microbes at work – is the price too high?'.

New York Times, 7 November 1996. 'Genetic Soybeans Alarm Europeans' by Youssef M. Ibrahim. Online version retrieved on 17 June 2011, from: http://www.nytimes.com/keyword/soybeans.

New York Times, 16 January 2012. 'BASF to Stop Selling Genetically Modified Products in Europe'. Online version retrieved on 15 April 2012, from: http://www.nytimes.com/2012/01/17/business/global/17iht-gmo17.html.

ORGAP Project, (2007). 'Implementation of the European Action Plan for Organic Food Farming: Action 12: GM contamination'. Online version retrieved on 1 February 2012, from: http://www.orgap.org/documents/action_points/action_point12.pdf.

Peterson, Barbara, H., (2011). 'USDA National Organics Program – Testing for GMOs NOT Required!', Online Report from Farm Wars, Fighting to Save the Family Farm. Online version retrieved on 1 February 2012, from: http://farmwars.info/?p=5426.

Spinks Report Info: http://www.ncbi.nlm.nih.gov/pubmed/2573088.

Occupy Movement: http://www.occupytogether.org/.

EFSA official website: www.efsa.europa.eu.

Canada court case, Percy Schmeiser website: http://www.percyschmeiser.com/conflict.htm.

Gene Watch:
http://www.genewatch.org/uploads/f03c6d66a9b354535738483c1c3d49e4/brief29.pdf.

Personal Learning Objectives:

Expected learning objectives have been involved and mostly achieved during the research. I have learned a lot about my own skills and the relevant topic. It is now obvious for me that I need a stimulus of clear purpose to my work. If I cannot see a value or a contribution with what I am producing I start neglecting its relevance. A stimulus to publish and/or further deepen my impact through a PhD or similar gives me more motivation to write and research. I am thankful to my Professor who understood this and supported my visions and criticism throughout the process.

During the research phase it became clear to me that my skills in understanding issues and entwined linkages between aspects are great. Mostly I have gained trust in my skills which gives me some confidence about what I can. My communication skills are great as I expected. I can approach people easily to find out more about aspects I am interested in. However, I am not yet very good to keep valuable contacts over time and do phone calls to people I do not know. Also I had to confront a language problem during interviews in Germany. Professional words related to GMOs have changed in some regards and I had to adapt my vocabulary.

The biggest challenge I faced was to structure the complexities of reality into simplified 'red threats'. My writing has improved a lot since the beginnings of my studies, however, I am still struggling to maintain a clear focus within my writing instead of wanting to involve all relevant aspects. I guess, writing a book with more chapters and various involved aspects would be interesting to try. Like that I might find the actual space to put in all relevant aspects.

It became apparent to me that during my studies I have improved many skills. However, by an ever increasing knowledge of aspects I have more problems to develop clear opinions and/or beliefs. All is relative and can be modified by varying views and/or understandings, even ethical perceptions and/or morals, or just in general by new knowledge. My confidence in making clear statements has thus decreased. Nevertheless, I have discovered that neither just knowledge nor just my morals make me smart or 'beeing right' about something. More important is my openness to understand others but especially my belief into certain values which determine my purpose for the use of knowledge. I am sad that this aspect is not more underlined during studies, that instead of training a creative use of knowledge it again and again is implied that

knowledge is either right or wrong, strong or weak. Creativity and values are dismissed by many as relevant argumentation. However, science is creativity of using knowledge of course entangled within given methods, structures, numbers and words. All in all I am happy that I have met but a few professors and specialists who share such views.

Related to the topic of research I have understood more about policy change and policy influence in general. I have met very interesting people and still remain in contact with many. Also future work possibilities presented themselves. Disappointing were experiences of attitudes of involved actors towards dialogue, openness and learning. The world of politics is a harsh one in which any creative or new comment will be easily dismantled into naive claims and dreams. For a moment I have had lost my respect and value towards science. Mostly I figured out that this is not because of science itself but rather of how science is presented as facts instead of step stones on roads of steadily developing answers and problems of nature and society. As such I have searched for people who think alike and who support a vision to transform the scientific system towards an inter- and trans-disciplinary one supporting common values: from the people for the people. With this I have regained my perceived value for science.

At last I would like to point out my gained belief that in almost all areas the economic value, which can mostly be translated into profit orientation, is placed by people and institutions on the highest pillars of hierarchy as criteria for project and policy developments, even for science and knowledge creation itself. This aspect influences the environment for policy and knowledge creation within our societies today to such extend that transformation is urgently called for from many concerned actors (NaWis and many more). Even Universities run into the problem of getting stuck within economic oriented management systems, forgetting about their important contribution to the future development of our societies (educating the new leaders of the future) and knowledge creation for the people. It is time that research facilities invest into a purpose oriented science and knowledge creation in order to support societies in their development and aid to tackle global challenges instead of supporting a further split of rich and poor by creating (and limiting) knowledge within the rationales dictated by markets and economic interest.