FNI Report 5/2007

Competing Knowledge Claims and GMO Assessment by the Norwegian Biotechnology Advisory Board

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August 2007

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Title

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Publication Type and Number

FNI Report 5/2007

Pages

30

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ISBN

978-82-7613-508-4

Project

0789

ISSN

0801-2431

Abstract

This report examines the process of assessing applications for genetically modified (GM) crops or plants for import or commercial planting in Norway. A growing consensus about, and increased rejection of, applications would seem to represent a puzzle as well as an interesting case, as it would go counter to current 'post-moratorium' trends in the EU. GMO legislation in Norway is closely linked to the EU through the Agreement on the European Economic Area (EEA), to which Norway is a party. A central difference with the EU processes is emanating from specific clauses in the Norwegian Gene Technology Act on 'sustainable development' and 'societal utility', which provides a wider leverage for Norwegian authorities to turn down the applications. While a high number of rejections may primarily be associated with the low level of malignancy, the increase in robustness and more detailed argumentation may be explained by learning and a growing acceptance of the precautionary principle in this sector. Final decisions are pending and we discuss uncertainties concerning whether Norwegian authorities will apply the specific criteria in the Gene Technology Act.

Key Words

GM, GMO, Norwegian Gene Technology Act, Norwegian Biotechnology Advisory Board, biotechnology, assessments, legislation

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1 Introduction[1]

This report examines the process of assessing applications for genetically modified (GM) crops or plants for import or commercial planting in Norway. The major research questions concern the assessments made by the Norwegian Biotechnology Advisory Board (NBAB) in its evaluations of GMO applications.[2] Are its assessments becoming more stringent and robust? If so, how can this be explained? If there has been a growing consensus about the precautionary approach and increased rejection of applications, that would seem to represent a puzzle as well as an interesting case, as it would go counter to current trends in the EU (Lieberman & Gray, 2006). It would also single the GMO issue out from general tendencies in sectors involving chemicals and pesticides in particular, where the precautionary approach has had less of a decisive effect in Norway (Fauchald, 2005), as well as biodiversity in general (Andresen et al., 2005).

As to the explanatory aspects, greater stringency and robustness might be due to changes in the composition of and access to the Norwegian Biotechnology Advisory Board. Alternatively, the explanation may be found in greater scientific certainty and consensus about the negative effects of GMOs. Both these dimensions indicate the need for a closer look at whether and how knowledge claims have given rise to or supported new principles or instruments in this issue area. These developments may also have fostered a change in the knowledge producers who gain access to the decision-making process. Thirdly, it should be borne in mind that GMO legislation in Norway is closely linked to that of the EU through the Agreement on the European Economic Area (EEA), to which Norway is a party. In line with the EEA, all GMO applications sent to the EU must be separately decided on by the Norwegian authorities within an almost identical legal framework. We thus need to take particular notice of how NBAB members are affected by such external developments as how GMO applications are handled within the EU. Fourthly, any differences between Norwegian and EU assessments may relate to the interest structure and cost-benefit calculations made by affected actors.

The methodological approach applied here involves examination of access structure in one of the main bodies responsible for GMO assessments, the Norwegian Biotechnology Advisory Board. This rather narrow focus on the NBAB will allow for close ‘process tracing’, making it possible to strengthen possible claims of causal links in the material (King et al., 1994). In addition to the analysis of the written documents that constitute the assessments themselves, interviews with central and relevant decision-makers have represented a major channel for data collection and methodological triangulation in this part of the study. Here, the question of EU influence is also central (section two). An in-depth analysis of the GMO assessments is presented in section three, where the development of arguments and principles are examined. This is followed by a framewrok for and discussion of the results in sections four and five.

2 Regulatory Framework for GMO Assessment

Today there is no broad international consensus as to what is at risk from GM foods and crops.[3] Considerable scientific uncertainty attends the effects of GMOs with regard to both the environment and human health.[4] The uncertainties regarding environmental effects pertain to the risk of GMOs affecting or displacing native species and to the risk of 'genetic contamination' in the event of cross-breeding between GMOs and related native species.[5] Uncertainties about the potential effects of GM food products on human health include the threat of creating greater resistance to antibiotics. On the other hand, it is recognised that GM plants have the potential to benefit the environment by, for example, reducing the need for pesticides while at the same time increasing agricultural yields. Another benefit is the great potential for developing new medicines and vaccines.[6] The debate involves legal, technological, trade-related, ethical, and political considerations, and has engaged actors at all levels, from the local to the global arenas. In this section I present the regulatory frameworks in which this debate takes place at the national (Norwegian), regional (EU) and international levels. This debate influences Norwegian policy-making and relates to the development of knowledge, to trade in biotechnological products, and legal frameworks and obligations established in other parts of the world (White Paper, 1991:40).

Five levels of legislation make up the framework for dealing with GMOs in Norway. First, there is international hard law, which includes the WTO (SPS and TBT) and the Cartagena Protocol on Biosafety under the Convention on Biological Diversity (CBD), and concerns the right to apply limits, including the precautionary principle. Norway was a pioneer in developing GMO regulations and has remained a very active participant in international processes dealing with this issue, such as the development of the Cartagena Protocol. Second, there is international soft law, made up of the developing standardisation on the level of protection together with the decisions of individual countries on risk assessments and risk management based on the precautionary principle, among other things. For Norway, the EEA brings an additional third level, composed of legally binding EU Directives and Regulations. This comprehensive system includes Directive 2001/18/EC[7] on Deliberate Release of GMOs, Regulation No 178/2002 on Food Safety Authority, and Regulation (2003) on traceability and labelling. Fourth, at the national level, Norway's Gene Technology Act (No. 38/1993) is the most important. The fifth and final level relates to national assessments and decision-making, adding to the legal body relating to GMOs.[8] For Norwegian policy-makers, EU regulations and the Norwegian Gene Technology Act constitute 'hard law', which must be observed in decision-making. As diverging obligations following from these two legally binding frameworks are particularly difficult to handle, it is these two levels that will be in focus in this section.

Within the OECD sphere, the EU has enacted some of the most restrictive rules in this field, matched only by Norway's GMO legislation. At present, the Norwegian Gene Technology Act represents yet another step towards precaution, with its stipulations that processing and use of GMOs must be 'ethical', have a 'public utility' and contribute to 'sustainable development' (§10).

European biotechnology industries have pushed for de-regulation in hopes of getting a level playing field with their counterparts in the USA; nevertheless, the EU's GMO regulations have become increasingly stringent (Bernauer, 2003; Rosendal, 2005). The process now involves environmental risk assessment, mandatory post-market monitoring of GM products, obligatory provision of information to the public, and requirements for labelling and traceability at all stages of the marketing process. In practice, the last time the EU member states approved the commercial growing of a GM plant was in 1998. This restrictive practice, known as the 'de facto moratorium', prompted a reaction from the USA, which argued that the EU used this for protectionism in violation of the WTO agreement.[9] The political controversy here revolves around the interpretation of the precautionary approach as elaborated within EU regulations as to GMOs and the 2003 Cartagena Protocol on Biosafety, as against the stronger emphasis on scientific evidence of risk articulated in WTO agreements.

The unofficial EU moratorium ended in 2004 – although not yet for commercially grown GM crops – parallel to the entry into force of Regulation No 178/2002 on Food Safety Authority and Regulation (1830/ 2003) on traceability and labelling.[10] The ending of the 'moratorium' can also be seen as a response to the USA taking the EU to the WTO. Since then, EU approval processes have ended in deadlock fourteen times in a row; ten approvals have been granted by the EU Commission unilaterally.[11]

Applications for deliberate release and commercialisation of GMOs follow EU Directive 2001/18/EC and Regulation (EC) No. 1829/2003 on genetically modified food and feed. According to its article 6(8), the deliberate release of GMOs into the environment can only be authorised by the explicit decision of a Competent Authority (CA). By stating that the 'Member States may take into consideration ethical aspects when GMOs are released',[12] the Directive allows for differing national standards based on ethical judgement. For instance, while Finnish law is strictly focused on ecological and health risks, Swedish law permits greater discretion concerning not only the physical effects of the GMO but also societal effects. The applications and affiliated reports are to be sent to all member countries, who have 60 days in which to raise any questions.[13] A qualified majority vote among the Competent Authorities is necessary for approval of an application. If this fails, the application is returned to the Council of Ministers. If the Council again fails to reach a decision (and this is what invariably happens), the case goes to the Commission, which has the final say. New GMO licences have been resolutely opposed by a 'hard-core' group of EU member states (Denmark, Greece, France, Italy and Luxembourg) with a blocking minority in Council (ENDS 2003). During the unofficial moratorium, the Commission did nothing under these circumstances; since the moratorium was lifted, the Commission has ruled in favour of the applications (see Lieberman & Gray, 2006).[14] In most cases the Commission's approval of new crops has been based on positive scientific opinions from the European Food Safety Authority (EFSA). Several ministers have been critical to EFSA and urged the scrapping of the procedures that have allowed the European Commission to end the EU's de facto moratorium

on new GM crops despite opposition from many governments (ENDS, 2006).

EU Directives and Regulations generally apply to Norwegian assessments of applications for import and trade in GMOs. The applications and affiliated reports are sent to all the EU/EEA member countries; at this stage, Norway may also present its own questions. A GMO application that has been approved in the EU will automatically be open to commercialisation in Norway as well, but the Norwegian authorities may ban it if it is deemed to present a risk to health or the environment, or a breach of the Norwegian Gene Technology Act. Norway's Ministry of the Environment is responsible for deliberate release of GMOs and is also the Competent Authority (CA) in Norway.[15] The domestic decision-making process is co-ordinated by the Directorate for Nature Management. Applications are sent out to expert agencies, including the Norwegian Scientific Committee for Food Safety and the Norwegian Biotechnology Advisory Board. The Biotechnology Advisory Board consists of 21 members, 13 appointed on a personal basis and 8 appointed by nomination from various public organisations. The 13 personally appointed members come from a range of research institutions and the private sector. The 8 are appointed by various interest groups, including environmental, medical, industrial, agricultural and labour organisations. In addition there is a highly qualified secretariat of five members, who provide advice and expertise. Observers from six government ministries also participate in the meetings of the board.

The EU violated global trade rules when it failed to grant market approval for a series of genetically modified crops for almost six years between 1998 and 2004, the WTO declared 8 February 2006.[16] However, this WTO ruling imposes no sanctions and will have little practical impact, as the EU has since overhauled its GM licensing rules as well as ending its de facto moratorium in 2004.[17] Since then, the EU Commission has authorised ten GMO applications, all involving import and use in feed or industrial processing, not commercial cultivation. This reversal of the Commission's policy, based on advice from EFSA, has been criticised by several member states. The legal framework is also in theory open to variation among member states in their approach to GMOs, based on ethics and precaution. What then are the trends in Norway's assessments of GMO applications, and how are these assessments affected by the situation in the EU?

3 Developments in NBAB Assessments

From the similarities in the legal framework as well as the general Norwegian tradition of following the EU lead, we could expect similar trends in Norway's GMO assessments. As yet, no commercial growing of GM crops has been allowed in Norway, but a large number of applications are pending. By contrast, within the EU ten applications have been authorised, although no GM plants have been accepted for commercial growing and here also several applications are pending final decision. Hence, the similarities may still end up being greater than the differences. On one side, this means taking into account the scepticism among roughly half of

the EU Member States concerning the reversal of the trends in the Commission practice. On the other side, there is still suspense with a view to the final decisions.

In this section I analyse the 50 cases of GMO applications that have been dealt with by the Norwegian Biotechnology Advisory Board (NBAB) since 1994 with a view to assessing the stringency and robustness in the argumentation. I take increased stringency to indicate a greater tendency to argue for precaution in assessments, as well as increased rejection of GMO applications. Increased robustness will be taken to indicate a higher level of consensus in the NBAB recommendations, either which way they go.

The number of applications quickly picked up after the EU moratorium was ended. In order to compare developments over time, it is logical to operate with three main phases: an early, pre-moratorium phase (1993–1998) with 24 applications, a moratorium phase (1999–2002) with only five applications, and a post-moratorium phase (2003–2005) with 22 applications. Most applications concern modified maize (16), and then follow rape (nine), cotton (six), three varieties of carnation and three varieties of potato. Some ten other GM plants have been applied for only once or twice. In Norway, four of the EU applications for deliberate release have been granted thus far: one tobacco plant (grown in France) and three varieties of carnation (the flowers imported on stem only).

I have analysed the attached recommendations by the NBAB following each of the applications. The main lines of arguments or principles applied by the NBAB when requesting information prior to possible acceptance can be divided into three broad categories: environmental, human health and societal concerns, with various further sub-concerns.[18] Against this background, I analyse developments in the stringency and robustness of the argumentation presented by the Board.

We can see changes in the argumentation used by the NBAB during the various phases. The recommendations show an increased stringency and robustness, as well as a gradually greater scope and depth of detail, which may also be linked to robustness. With the cases that involve antibiotic resistance, both stringency and robustness have increased over time. This is evident from the fact that in the early phase, the inclusion of this particular feature was not met with complete rejection: on the contrary, in eight of the twelve cases there was a majority or large minority on the Board in favour of granting the application. In the end, however, none of these was granted approval by the Norwegian authorities. Increased robustness is shown by the Board's almost complete unanimity in dealing with such applications during the post-moratorium phase (2003–2005). In the 22 cases considered in this phase, there is but one exception to this rule – one member in favour of granting the application and 15 against (Corn C/ES/00/01; February 2005). In comparison, of the 24 cases considered in the pre-moratorium period, only four were unanimously rejected and a few were recommended by the NBAB. In most cases, there were changing minorities and majorities in favour of the applications. These trends indicate that there has been both increased stringency (from some approvals to total rejection) and increased robustness (from dissent

to almost complete unanimity) in NBAB recommendations in the post-moratorium phase.

Second, we can see a trend towards a more comprehensive argumentation, in the sense that health and societal concerns are more widely applied. There is greater detail both in the depth and in the scope of arguments cited by the Board. During the early phase (1993–1998), GM technology itself was in an early stage, and there was considerable uncertainty concerning the promise of reduced pesticide use. This was a major argument employed by the NBAB for returning such applications with a request for further information (9 of 24). During the same period, there was also frequent uncertainty concerning the risks of cross-pollination – the spread of GM traits to related species (11 of 24 applications). Environmental concerns have persisted throughout the three time-periods. It is within the other two main categories of concern (health and societal) that the arguments have expanded. These types of arguments were but briefly mentioned during the early phase, closely linked to environmental concerns. Typically, requests for further information about whether a GM plant would affect the level of pesticides positively or not were frequent in the pre-moratorium (1993–1998) period. This argument was often mentioned in connection with societal concerns, but could just as well be categorised as an environmental issue. While few of the early assessments made reference to health issues (three references only to possible toxicity), we find this category far much more widely applied in the post-moratorium phase (2003–2005). Here there is a broadening of concerns about potential negative effects on humans, including allergies and the ability to digest the applied enzymes. As regards societal concerns, these have been expanded from a main focus on environmental pesticide issues to a broad range of global concerns. Arguments now include access to seeds for food security, effects on global agricultural structures, and North–South issues of equity. This represents an expansion and operationalisation of the special inclusion of 'ethics, societal utility and sustainable development' in the Norwegian Gene Technology Act of 1993.

A related trend in terms of the observed broader argumentation relates to the use of the precautionary principle. Throughout the phases of assessment, the Biotechnology Advisory Board has made frequent reference to this principle. Here the NBAB differs somewhat from other authoritative Norwegian sources: the Walløe Commission (NOU 2000a:29) recommended giving the green light to GM food, despite its conclusions about the uncertain health effects involved. At the NBAB open meeting, which discussed the Walløe Commission report, the report met with criticism for going against the precautionary principle (NBAB 2000b). Typically, the controversy over GMO assessments hinges on whether to apply precaution or, with closer adherence to the WTO system, rely on 'sound science'.

In order to further substantiate or contest these findings, I have used interviews for methodological triangulation. The respondents come from various sectors and interest groups, including the environment, industry, academe, civil servants/government officials, and the secretariat of the NBAB. Key actors who are central in the decision-making on GMO

assessments were asked whether they agreed that there had been an increase in stringency and a tendency towards applying more varied lines of argumentation in the assessments. Respondents were unanimous in responding that today there is more varied argumentation, including not only environmental but also health and societal concerns. Moreover, all respondents agree that there is a trend towards a more restrictive practice and an increasingly critical and precautionary approach to GMO applications. They all felt that the more liberal approach of the early phase has been replaced by an almost unified and hence more robust agreement in the NBAB in favour of heeding environmental, health and societal concerns. In this sense, Norway's approach to GMOs reflects that predominant within the EU, as a precautionary approach to health and environmental issues has tended to prevail over industry's demand for deregulation in this issue area (Rosendal 2005). As indicated in section two, the final results of the GMO assessments may, however, prove different in Norway and the EU. My respondents also emphasise that it is important for Norwegian authorities to adhere to EU procedures in the decision-making process. Hence, there would seem to be an inherent contradiction in the expectations regarding the results of the decisions by Norwegian authorities in this case. How can we explain the preliminary results against the crossfire of international and sub-national concerns?

4 Explaining Assessment Trends – Framework for Discussion

Having concluded that the GMO assessments of the Norwegian Biotechnology Advisory Board have become more stringent and robust over time, I discuss how this can be explained. First, it is necessary to examine how competing knowledge claims achieve access and legitimacy to participate in and influence the assessment- and decision-making process relating to GMOs in Norway. An important basic insight in the science–policy relationship is provided by March and Olsen (1995: 101), who note that the authority and status of science hinges on its disengagement and autonomy towards government and various interest groups. Moreover, a predominantly rationalistic-instrumental approach to the impact of scientific advice in a policy process maintains that this will depend on the degree of uncertainty, discord or consensus (Underdal, 2000). With a view to assessing consensus, autonomy and disengagement, we thus need to look at the sources that produce the relevant information.

This accentuates the question of how to distinguish between scientific knowledge production and the political strife between social interest groups. Skodvin and Underdal (2000:22) point out the complexity of the science-policy dialogues and that there is no clear-cut demarcation between the spheres of politics and science. The idea of science as objective and disassociated from political struggles is broadly challenged, although there are still gaps in our knowledge about how new principles affect the science-policy dialogue in environmental governance. One such principle is the precautionary principle, which affects the link between scientific certainty and the assessment of policy options and which opens for a wider range of disciplines that may compete in bringing policy relevant knowledge into decision-making (Gulbrandsen, 2007). Another

new principle in environmental governance is transparency and participation, which also has the potential to affect access to decision-making. Environmental risk assessment is characterised by the legitimate involvement (access) of a growing number of groups and organisations – including university institutes, applied research institutes, consultancy firms and the research institutes of stakeholders, such as governmental and other public agencies, industry organisations, and environmental advocacy groups (Stokke, 2005).

What does 'legitimate involvement' imply? This question is highly relevant to the examination of access. Legitimate involvement is in fact fraught with stumbling blocks, as the gap between science policy-makers and the general public is widening in the biotechnology sector (Irwin, 1995). Public deliberation has many advantages, such as participant learning, the inclusion of social values, awareness building and stimulation of public debate. The potential disadvantages concern questionable representation, high costs, the readily manipulative agenda setting, and vague conclusions (Mohr, 2002). Controversy about representation and access can be expressed as politicisation, illustrating the level of NGO mobilisation and industry protest (Stokke, 2005). It is further assumed that a high degree of politicisation will make scientific advice less directly applicable in decision-making (Ibid). This also points up the difficulty in classifying some knowledge claims as 'facts' or 'scientific' and others as norm- or value-based argumentation. Where do we draw the line, and are some of these arguments more valid than others?[19] This difficulty is typical of applied science areas, such as environmental assessments, where there is no clear demarcation between science and policy. The boundaries here are negotiable and may shift as a result of political priorities (Jasanoff, 1990).

This ambiguity in views on knowledge can be accentuated from either ideational or more political perspectives. Predominantly ideationally or cognitively based approaches will tend to highlight learning processes and the generation and acceptance of common norms and ideas (Franck, 1990; Haas et al., 1993; Young, 1991). From a more political angle, Barnett & Finneman (2004) point to the framing effect of technical terminology, and direct attention to how organisations may mould negotiation outputs, in effect influencing the type of knowledge producers that gain access to decision-making. A similar discourse is found in Karen Litfin's work. In her view – and basic to discourse tradition – power and knowledge cannot and should not be separated. In effect, this relationship becomes the major focal point of these analyses: 'interests must be problematized as arenas of political struggle that should be formulated in light of contending knowledge claims' (Litfin, 1994:2). The point about this intrinsic power/knowledge relationship is clearly important when it comes to issues involving the environment, where science and politics are often subtly intertwined.

One implication of looking more explicitly into power and interest relations in the science–policy relationship is to examine the malignancy of the issue at hand. 'Malign' in this sense refers to the magnitude of costs linked to behaviour change following scientific advice (Underdal, 2000). A common example of an easy-to-solve issue-area involves the interna-

tional efforts to combat ozone depletion. This global pollution issue was in the later phases characterised by a low degree of political contention and fairly simple technical solutions with relatively low costs to the parties concerned. As large industrial corporations did manage to develop substitutes for CFCs, and thus achieved a comparative edge, they emerged as important environmental allies in the push for stricter regulations. All countries are vulnerable to ozone depletion, while the costs of phasing out CFC gasses have been relatively low. On this basis of cost-benefit analysis, ozone has generally been regarded as a "benign" issue. Issues such as climate change and biodiversity are by contrast seen as much more malign, involving high costs for major stakeholders from following scientific advice.

Briefly put, a high level of scientific consensus and a low level of politicisation and malignancy will provide greater scope for scientific advice to influence decision-making. And the converse: a high level of competing knowledge claims will increase uncertainty and discord, in turn presumably rendering such advice less applicable in the political decision-making process. Likewise, a high level of politicisation between proponents and opponents is assumed to lessen the scope for knowledge claims to impact directly on political decisions. Such a situation of explicitly conflicting interests may also be expected to accentuate questions relating to access to the decision-making process. Drawing in the same direction, in cases where scientific advice is perceived to be costly (malign), it will be less likely to have an impact on decisions. These factors are examined in the discussion on assessment of GMO applications in the next section.

5 Discussion

In this section I draw on the results from my interviews with respondents from a wide range of sectors and interest groups and the secretariat of the NBAB. The same key actors who were asked about stringency and robustness were also asked how they would explain the changes. This was first posed as an open question, after which the respondents were presented with a set of explanatory factors that might account for the change and developments. One explanation for the change could be related to changes in the access structure of the NBAB itself – that change was due to differences in the composition of Board membership. Another explanation could be that the changes were caused by the members changing their views of GMO; this would be related to learning and an altered knowledge base. This will be examined by looking at how new environmental principles have affected decision-making. In the following, I first look at the composition and consider the evidence relating to access. The next section discusses the status of knowledge, and finally the malignancy of the issue area is examined. In all sections a central question relates to how access structure is affected by the various explanatory factors.

5.1 Legitimate involvement and Politicisation

Politicisation concerns the degree of NGO mobilisation and industrial protest and is thus likely to have a direct impact on access and what is perceived as legitimate involvement in a decision-making process. The assumption is that a low level of politicisation will provide greater scope for what is perceived as neutral scientific advice to influence decision-making. A study of the GM debate in the UK, Australia and New Zealand found that access to decision-making and the inability to weigh explicit social value judgements with the broad science consensus were the major obstacles to successful deliberative public debate (Walls et al., 2005). For instance, in the New Zealand experience, non-scientific arguments were implicitly marginalised because the templates (questionnaire) employed for interest groups made it difficult to use holistic arguments. A 'holistic argument' in this case might imply a consideration of the growing dominance of multinational corporations in the life sciences. These enterprises increasingly decide on options for the development of new medicines and food, they are part of the GM revolution – but somehow their role seemed to be 'beside the point' in the questionnaire developed to study the public debate (Walls et al., 2005). A similar view is further elaborated by Sheila Jasanoff (2005), who points out how science–policy relations in the biotechnology sector are characterised by the growing absence of public participation and a lack of democratic institutions to deal with this. In the following, I take a closer look at the composition of the NBAB in order to discuss access. I also examine the extent to which the Board's composition and access of knowledge claims have been controversial with regard to this issue in Norway.

The Norwegian Biotechnology Advisory Board was established in 1991 with an explicit mandate to be independent from political authorities and institutions. A proposal from the Labour government in 2000/01 to institutionalise the NBAB under the Ministry of Health failed due to strong opposition from the Coalition government in 2002.[20] Two years later, the Coalition government, in particular Health Minister Dagfinn Høybråten, was on its part strongly criticised for appointing NBAB members to suit Christian Democratic values.[21] Currently, the NBAB consists of 21 members; it can take valid decisions if more than half of those are present. This would seem to place a great importance on which individuals are present for any particular decision. However, in practice the NBAB has been uniform in its views on applications – actually more uniform today than 10 to 12 years ago, respondents agree. There is no conclusive evidence that the greater stringency in the Board's GMO assessments may be traced to changes in its composition. Although there have been changes at the individual level, the composition in terms of representation of interest groups has remained fairly similar throughout. For instance, the number of representatives from industry has been stable at two representatives during the life of the NBAB. The actual influence of industry has, however, not been stable: respondents largely agree that the views of the former have become marginalised. Only one respondent hinted that change of leadership might have had some minor effect.

A central question with regard to access is to what extent the composition of the NBAB has been contested. As an advisory board to politicians, the

NBAB would need to fill both the criteria of skills and disengagement in order to be entrusted with 'legitimate involvement'. First, the Board takes into account the knowledge and disciplines already represented in its members, including a wide variety of skills and experience. One respondent pointed to the report (NBAB, 2000a) on implementation of the concepts of 'sustainable development, benefit to the community and ethics' and how this has helped to operationalise the precautionary principle in GMO assessments.[22] In effect, the Board has heightened its internal competence and rarely feels the need to involve more experts from outside. Another respondent described the Board's expertise as 'very relevant, expert lay people's assessments, based partly on "sound science" and partly on a broad variety of values and knowledge from various sectors of society'.[23] This may help to answer the question of what is perceived as knowledge with legitimate involvement: This knowledge includes 'sound science' as well as a broad understanding based on various kinds of experience from different parts of society. It would seem to indicate that societal knowledge is accepted as legitimate input in the policy-making process and that it is accepted as part of practicing the precautionary principle. It was also stressed that Board members feel free in making decisions, even those members who have been nominated by organisations. This, according to several respondents, makes possible for very broad debates. It also paints a picture of the NBAB as a combination of experts and lay persons, indicating acceptance of a variety of knowledge claims from differing sources and interests.

Furthermore, as regards disengagement, the Biotechnology Advisory Board reflects Norwegian public opinion to very high degree, especially in this issue area. In contrast, the NBAB has been criticised for failing to inform the public sufficiently in controversial and important cases such as prenatal diagnosis (Halgunseth, 2006). The criticism raised concerning appointments under Health Minister Høybråten was mainly aimed at medical issues, such as research on fertilised eggs (embryos), use of ultra-sound and therapeutic cloning. With regard to its recommendations on GMO applications, however, there have been no instances of criticism of the Board in Norwegian newspapers. As gene modification is a contro-versial issue in Norway, it is not very likely that this is due to the NBAB being 'invisible'. Compared to the public and political criticism raised about EFSA, the Biotechnology Advisory Board would seem to enjoy considerable legitimacy with the general Norwegian public – a point on which respondents from the industry sector also partly agreed. On the one hand, the Norwegian biotechnology sector realises it does not constitute a strong lobby, being too small and fragmented to have much influence within this policy field. Hence, the composition of the NBAB would seem to have a high level of legitimacy with the Norwegian public. This general trust and legitimacy of the NBAB in the GMO issue may indicate a development towards greater public acceptance of the precautionary principle in this sector. Increased trust may have come about through learning and greater acceptance over time in public opinion. Greater acceptance of the precautionary principle may thus have contributed to declining politicisation in the issue area and a low level of controversy with regard to the question of access and composition of the NBAB.

On the other hand, industry would clearly have preferred a body more in line with EFSA. The industry sector has argued that the NBAB is not competent to review documentation; rather this should be left to the Norwegian Food Authorities (Mattilsynet) or to scientific committees. It was regarded as a problem that Norway lacked competent organs to conduct this type of assessment, compared to the EU where the EFSA is responsible for GMO assessments. To this end, the Norwegian Biotechnology Association (NBA, which is party to EuropaBio) sent letters to the Ministry of the Environment and the Ministry of Health and Welfare, requesting three changes.[24] First, they asked that Norwegian GMO assessments should be harmonised with EU regulations. Second, they requested changes in the Gene Technology Act to exclude the demands concerning ethics, sustainable development and societal utility. Third, they asked for a new composition of the Biotechnology Advisory Board. NBA argued that the recommendations of the Board under its current provisions led to unpredictability and that the legal framework did not provide Norwegian biotechnology industries with a level playing field compared to that of the EU. The two ministers in charge at the time, Knut Arild Hareide and Ansgard Gabrielsen, both replied with firm refusals to this petition. Gabrielsen pointed to the broad political consensus regarding the importance of taking ethical and societal considerations into account in assessments of modern biotechnology.[25] In retrospect the NBA regretted its forceful move, fearing that the sole effect was greater politicisation in an already hot policy field.[26]

This section has indicated that a growing acceptance of new principles (in particular the precautionary principle) in the Norwegian public at large reflects and underpins the composition of the NBAB. Hence, this may go some way in explaining the increased stringency and consensus in the NBAB recommendations. Still, it is pertinent to investigate alternative explanations and check whether changes may be linked to knowledge about potential dangers posed by GMOs. On the one hand, it is possible that the different interpretations are two sides of the same coin: The NBAB may have become more stringent, detailed and robust in its assessments because information and knowledge have been produced that reveals more drawbacks and dangers concerning GMOs. On the other hand, proponents of GMO technology could still argue that the greater stringency is due to the composition of the membership of the Board, and claim that the individual members bring their own (biased) value-based distrust into the assessments. Where does knowledge stop and values begin? And should one have precedence over the other? Is knowledge restricted to 'scientific facts' – and if so, does this include more qualitative, 'soft' scientific findings about societal and socioeconomic aspects? Recalling Jasanoff on the shifting boundaries between science and politics in environmental assessments, this leads to the question of how the precautionary principle is applied in GMO evaluations. To what extent does it include the criteria of the Norwegian Gene Technology Act about ethics, sustainable development and public utility? This ambiguity in passing judgement on trends in GMO assessments echoes the WTO decision and puts the searchlight directly on the question explored in this paper: How to assess the application of competing knowledge claims in a decision-making process?

5.2 Scientific Consensus and Controversy

5.2.1 Different developments in Norway and the EU: The case of antibiotic resistance

During the interview sessions, respondents indicated various opinions as to how to explain the trends observed. Many felt that the increased stringency and consensus have been caused by changes in the actual knowledge status of NBAB members. As a central example of greater scientific certainty, it was pointed out that concerning GMOs containing antibiotic-resistant genes, the growing tendency towards rejection is primarily linked to additional information and knowledge now available. In part, the NBAB bases its argumentation on a decision of the Norwegian Parliament (the Storting), asking the government to ban production, import and sale of all GM products that contain genes coded for antibiotic resistance.[27] Increasingly, it is argued that this trait should be avoided altogether, even though antibiotic resistance may be a very efficient part of practising GM technology. This would seem to fit well with the proposition that greater scientific agreement enhances the scope for knowledge claims to affect a decision-making process. However, the same 'learning process' does not seem to have influenced EU decisions, as the following example will show.

As a reaction to the EU moratorium, industry has tried harder to find alternative technical solutions, avoiding antibiotic resistance as a technical means to multiply and isolate the material needed. However, some of the technical solutions currently in use apply less risky antibiotics, such as those no longer administered in affluent societies. This pinpoints an *important difference in EU and Norwegian assessments*, as the NBAB will argue that the technology may have harmful effects on health in poorer countries in the South, where those phased-out antibiotics are still in use in healthcare systems. The Norwegian Gene Technology Act, with its clauses on 'societal utility' and 'sustainable development', comes into play with a view also to health and environmental effects in Third World countries. If GMOs caused antibiotic resistance for these particular types, that would be harmful in poor countries. By contrast, within the EU, the EFSA GMO panel (EFSA, 2004) has recommended an added element in the regulations by introducing 'divisions of risks' and arguing that antibiotic resistance should be considered problematic only if it has a possible negative effect on health and the environment – and this is interpreted to apply solely to conditions in Europe. The difference between the EU and Norway is hence linked to the EU approach to GMOs that are not grown commercially in Europe. The EFSA 'division of risks' has led the EU to decide that information on environmental concerns is no longer required in such cases, while Norway still requests such considerations. As a consequence, these applications need not carry information about environmental concerns, because the application is not for cultivation (growing) in the country applied to. When Norway requests additional information about environmental effects relating to these cases no such information is forthcoming. It has been interpreted as a strategy from industry that the applications are for import only – not cultivation – of the plants in the EU.

This example indicates that Norway might be prepared to be more critical than what is generally accepted in the EU. That would mean that the most important external explanatory factor – EU behaviour – would seem to have had less than anticipated impact on Norwegian GMO assessments. This view was, however, supported by only one respondent.[28] The other respondents maintained that the EU was still very important as a role model. On the same note, one respondent pointed out that any deviant Norwegian decision had yet to be criticised by the EEA Committee.[29] However, the same respondent added, it was impossible to rule out criticism and potential pressure with regard to future deviant decisions.[30] One indication that Norway could turn towards a greater acceptance of EU trends is found in a recent report from the Norwegian Scientific Committee for Food Safety (VKM, 2005), recommending that Norway accept the EU 'division of risks'. In practice, this would mean that Norway would need to change its Gene Technology Act. The conclusion in the report is controversial within the NBAB secretariat. 'This is a political statement. We need competent skilled experts, as it is impossible to make the necessary judgements without skills. But how can we prevent these from turning into political actors?'[31] As yet, no such legal changes are envisaged by the Norwegian authorities.[32]

On a more general level, the Norwegian Biotechnology Advisory Board is mandated to take a comprehensive decision that takes into account the specific Norwegian criteria of sustainability and societal utility. These criteria would seem to provide Norway's decision-makers with an iron-clad argument: Norway is the only country to ask about sustainability and societal utility, and the applicant never provides information about such matters. On the other hand, there is a widespread view that Norwegian authorities will prefer not to go solo on this argumentation – and the special criteria, with their implication for judging e.g. the antibiotics cases, are not part of the argumentation and regulations of the EU. This raises the question of whether Norwegian authorities may in the end accept a reversal of the burden of proof. Will the failure by industry to provide information on sustainability and public use be the responsibility of Norwegian authorities? Likewise, the question is whether it should be the responsibility of Norwegian authorities to collect information on sustainability and public utility. This indecisiveness on the part of Norwegian authorities would seem to question the criteria of the Gene Technology Act.

These examples lead us to a further examination of the documentation that accompanies GMO applications. It is relevant to see how this documentation is perceived and applied by the Biotechnology Advisory Board and whether additional sources of knowledge are used as well. This calls for an examination of how scientific uncertainty and discord play out in this issue area.

5.2.2 Uncertain science, discord about technology

It is assumed that a high level of scientific uncertainty and discord might render such advice less applicable in the political decision-making process. There is still considerable scientific uncertainty about the effects of GMOs on the environment and human health. However, the dissent is

even more apparent when we look at the technology involved. The specific nature of biotechnology should be kept in mind, as compared to polluting industries, adaptive innovation is less of an option by which to meet critical voices: Unlike the situation in ozone and climate issues, the biotechnology companies hardly face the option of 'cleaning up' their old, polluting products through technological innovation. Rather, it is the technology itself and the products from this technology that are disputed, as these present both potential environmental solutions and environmental problems. Important differences in the nature of science and technology have been explored by Andresen and Skjærseth (2007), who point out that it is often the latter that leads to greatest controversy in the political process of deciding how to handle environmental problems. On the other hand, they argue, 'Knowledge is necessary to diagnose a problem and prescribe what to do, and science is the major supplier of advanced knowledge' (p.186). With this distinction in mind, the main focus will be on disagreements concerning technology.

Globally, GMO risk assessments have been carried out largely by the multinational corporations that dominate the fields of agro-biotechnology and pharmaceuticals. In April 2006, EU Environment Commissioner Stavros Dimas was quoted that EU assessment procedures for GMO applications relied too much on short-term industry data. This controversial statement has relevance also in the Norwegian context. As indicated by Commissioner Dimas' statement, it has been held that most of the knowledge is produced within very few arenas, involving a limited number of independent actors (Myhr & Traavik, 2002). Most studies on GM plants and products are based on information provided by research laboratories and/or released by industry (Gaskell et al., 2003). This documentation, along with the GMO applications, is provided by multinational corporations that enjoy little trust on the part of the general public, whether in Norway or in the EU (Gaskell & Bauer, 2001). As expressed by several respondents, 'we know that Monsanto has paid for most of what comes out of these institutes – why can't there be more research funded by public institutions?'

The documentation accompanying GMO applications may be problematic for four reasons. The first and second problems regard transparency. Some of this information is available on the Net, through the European Food Safety Authority (EFSA), but most of it is confidential, which would seem to be a breach of the Århus Convention on public participation and transparency.[33] On this point, the concerns are similar in Norway and the EU, as illustrated by Commissioner Dimas' comment. Second, the documentation is huge and there are hundreds of megabyte documents attached to each application. It is mandatory for the NBAB to build up an argumentation based on this documentation, but the enormous quantities make thorough argumentation very difficult. Several respondents speculated whether it could be seen as a deliberate strategy from the applicants that they provide information in such great masses as to be hardly penetrable, at least not for non-experts. However, such a strategy could work both ways, as it would also strengthen the distrust of this type of knowledge producer. A related and more technical problem is that different knowledge claims spring from highly diverse disciplinary fields. It is very difficult to compare and make sense of the different claims

coming from e.g. ecologists and from molecular biologists, as they draw their observations on the basis of different research questions, methodologies and scales (respondent 3). This is also a source of growing uncertainties in this issue area.

The third and fourth problems concern the quality of the documentation. The documentation is supplied with references, but a substantial bit of this points back to the research departments of the applicant itself.[34] A respondent pointed out that this makes it hard to see how this could be judged as sound science. Correspondingly, my document analysis showed that the assessments from the Norwegian Biotechnology Advisory Board during the first two phases did not contain much reference to scientific sources, and then mostly from the industry sector. Only in the most recent years have other types of scientific findings from GMO studies been published, and these are now being cited in the NBAB assessments. This could simply reflect the fact that alternative sources of information are now being made available. It might also indicate a growing need to support the conclusions in the assessments, beyond mere reference to the precautionary principle. The fifth problem is particular to the Norwegian situation, namely that despite the information overload, important aspects are lacking.[35] Most apparent is of course the lack of information about sustainable development and public utility.

One result of these problematic traits would seem to be that, while knowledge claims from industry dominate the input side in decision-making through the increasing number of applications, industry actors and interests are largely marginalised in the actual decision-making process. At this later stage, competing claims to knowledge are produced by the ENGO sector and given considerable media coverage. The ENGOs also receive a higher rating of trust among the general public, compared to the regulatory agencies involved in developing science/policy risk management (Gaskell & Bauer, 2001).[36] While the normative persuasion of the precautionary principle thus seems to be strengthened, it is still important to examine alternative perspectives on policy-making processes. And that in turn means that we need to look further into the affected actors in this sector. Who stands to gain and who stands to lose from the recommendations issued by the Norwegian Biotechnology Advisory Board?

5.3 Malignancy: Who Carries the Costs of Rejections?

So far we have focused on the recipient of the applications. Let us now take a closer look at the sender. In judging the malignancy of a given case it is important to know who will carry the costs of possible rejection. The rationalist view is that science can provide necessary, although not necessarily sufficient, advice in designing environmental problem solving, provided that the advice is regarded as skilled and autonomous. Still, even from this perspective it is acknowledged that scientific advice may be greatly hampered in a situation of high distributive controversy – in other words, malignancy.

About 70 per cent of the applications come directly or indirectly from the three dominant corporations: Monsanto (merged or linked to Dow Agrosciences / Mycogen / Agrigen and Pioneer Hi-Bred / DuPont[37]),

Bayer (merged or linked to Plant Genetic Systems, Aventis[38] and AgrEvo/Hoechst[39]) and Syngenta (merged or linked to Novartis and CigaGeigy / Sandoz / Zeneka[40]). During the pre-moratorium phase, applications mostly concerned seed production and commercial growing for fodder. In the later phase, the plants are not designed for cultivation in the EU/EEA area, but are intended for import for use in producing animal fodder as well as food for human consumption. This indicates a more cautious strategy on the part of the applicants, also shown by the downward trend in the use of antibiotics resistance traits. Another part of the strategy is to initiate the authorisation process in a country known for its positive attitude to GMOs, such as the Netherlands, Spain or the UK. Few applications start out through such 'hard-core' countries as Denmark, France or Belgium, and so far none have tried to go through Austria or Italy.

We have seen that the applications do not include information about sustainability or societal utility. As it is only the Norwegian Gene Technology Act that requires such information, this is hardly surprising. It may well indicate that gaining Norwegian acceptance of GMO applications is not a particularly high priority with the applicants. Their first priority is likely to be acceptance in the EU countries, now that the unofficial moratorium is loosening its grip. The EU member states remain deeply split over whether to accept GMOs or not – a pattern repeated among the new members, who are also spilt about 50/50 (ENDS, 2004). The main sign that the moratorium has ended is the Commission's new policy of deciding in favour of GMO applications, in the face of persistent opposition. Norway's domestic legislation provides for a loophole in maintaining its refusal. As no other country makes similar demand for information on societal utility and sustainability, the applicants are unlikely to invest resources in providing it. Similarly, from the EU perspective, it may not be considered worthwhile to follow up any deviant Norwegian decisions with pressure to conform.

This discussion has a bearing on the question of where Norway headed. Until now, only the cases of cut carnations and French-grown tobacco have met with approval in Norway. All other GM applications have been turned down. Currently, however, there is a great pile of decisions pending. All respondents agreed how difficult it was to foresee how the results would go. It could be that Norway will follow the less stringent trend instigated by the EU Commission, as Norwegian authorities generally dislike deviating from the EU. The alternative is to use the legal acts available to Norway and continue rejecting GMO applications. Closer to hand and more likely is that most GM products knocking on Norway's door do not undergo cultivation in Norwegian fields but arrive through shop shelves. As one respondent pointed out, 'it is likely that they are here already' (respondent 4).

Apart from the last scenario, the answer may depend on the type of applications that will come in the future. The senders of the applications may not be overly interested in the Norwegian market, but there are other groups that might stand to gain from GM technology. So far, the plants applied for have had little practical utility for Norwegian farmers – such as rice, cotton and maize. This situation indicates that the GM issue is not

yet very malignant in Norway, as there are low costs involved for relevant actors in following the results of the assessment procedures. But what would happen with an application for a potato or a strawberry that could flourish with the application of far less pesticides? This might be of great economic interest to Norwegian farmers. So far, the likelihood of this scenario has not been great, as Norway represents a rather marginal climatic area for agriculture. However, North America certainly has a share of similar climatic zones and areas, so Norway must expect in the future to get applications that are much more economically interesting and relevant for Norwegian agriculture and, not least, aquaculture. This could bring new elements into the discussion also with a view to societal utility with arguments 'closer to home'.

On the other hand, the Norwegian farmer might choose to stick to the strategy of using 'GMO-free zones' as its marketing brand. In an open letter to the government (October 2006), the two main Norwegian farmers' organisations together with 13 more environmental, health and women's NGOs urged a general moratorium on all GM plants in Norwegian fields.[41] The organisations emphasised the environmental and health concerns and the precautionary principle, arguing that it is impossible to control co-existence between GM plants and traditional plants. Moreover, the organisations behind the letter expressed criticism of the work of the Food Authorities (Mattilsynet) on developing regulations for such co-existence. It is in fact quite rare for NGOs from so many different sectors and interests to manage to unite on a comprehensive statement such as this.

The criticism directed at the officially appointed expert bodies, such as the Food Authorities, as well as at the Walløe Commission and the Norwegian Scientific Committee for Food Safety (VKM), provides us with more insight about the main stakeholders within Norwegian GMO policy. First, the biotechnology industry has its clear economic interests tied to de-regulation of gene technology, but this coalition is not very influential in Norway. Second, a remarkably wide range of NGOs have a strong impact through their unified goal of keeping GMOs out of Norway. Third, there is arguably a manifestation of the traditional political cleavage line of growth versus preservation within the responsible Norwegian authorities. That picture is nuanced by the non-socialist parties generally being concerned about ensuring adequate information and consumer choice through labelling of GM products, while the socialist side and the agrarian party favour stricter risk management and import controls on GM foods and organisms. Still, Norway's conservative, liberalist and social democratic parties are largely united in their support for growth over preservation issues. As these parties dominate most government coalitions, the influence of the precautionary principle tends to be uncertain in any given issue area, when experts are directly appointed to advise politicians in specific cases. Whichever way the final decisions on GMO applications go, this will involve costs for the government, in terms of going against domestic public opinion, or against potential technological development and economic gains as well as the EU.

6 Conclusion

While the recent trend in the EU has been a rise in acceptance of GMO applications, the opposite might be true in Norway: it is far from evident whether Norway will eventually follow the European trends, as many applications still await final decision by the Norwegian authorities. Nevertheless, the Norwegian Biotechnology Advisory Board has been applying an increasingly broad range of arguments related to sustainability and societal concerns as basis for its rejection of the applications. A number of features specific to Norway may account for the NBAB recommendations, as well as providing some indications about future trends.

First, there is the difference in the legal regimes: Norway has largely adjusted its legislation to the EU rules in this issue area; however, the Norwegian Gene Technology Act opens for specific concerns on sustainable development and societal utility.

Second, the GMO issue in Norway is currently characterised by high scientific uncertainty and even higher technological disagreement. Such uncertainty is common for the issue in general, but would seem even more pronounced in Norway where the legal criteria involve demands for additional and different types of information. This would seem to imply a greater scope for value-based perceptions of technology, which in turn might result in a less rationalistic-technocratic approach to GMOs compared to other issues. This could lead to the question of whether the GMO issue is currently being debated in overly 'populist' terms. On the other hand, examples from the UK and New Zealand have indicated the problems involved in applying a holistic approach to the GM discourse. The public at large tend to view the GMO issue in a broader perspective, as part of the trends toward globalisation that involves less local control over choices in food and medicine. This example raised the question of whether it is legitimate for the more holistic arguments to become invisible. With the specific clauses in the Gene Technology Act, this particular situation would seem to be less likely to occur in Norway. Rather, the Gene Technology Act has made possible a more holistic evaluation in Norway, and also allows for consideration of conditions in third (world) countries. This means that Norway has the potential to pursue its international role as a 'green' bridge-builder between North and South, to a greater extent than harmonisation with the EU would allow for.

On the same note, the issue is currently one of quite moderate politicisation in Norway, drawing mobilisation mostly from one side only. A broad coalition of unified NGOs has dominated this field for a long time, both in Norway and in the EU. Both this study and several others indicate that industry and the corporate research interests have become marginalised in this field (see Bernauer, 2003). This would also seem to account for the low level of controversy concerning the composition of the Norwegian Biotechnology Advisory Board and the fact that its advice on GMOs has not been subject to public criticism, unlike the situation with EFSA in the EU. Several sources have maintained that the industry should not be the

sole producer of arguments in this decision-making process (Myhr & Traavik 2002). Norway is not alone in this view, as it is supported by part of the EU Commission along with the hard-core states in the EU. Eurobarometers keep reporting that the Europeans are sceptical about the advice from science as well as from the regulators in this field, and more than half are still sceptical to GM food products (see for example Eurobarometer, 2005). However, these features cannot account for the discrepancy between EU and Norwegian assessments. This discrepancy is better explained by the level of malignancy.

The case of GMO assessments in Norway is clearly one of low malignancy. All respondents agree that a main reason why Norway can keep turning down GMO applications is that they are simply not economically interesting to Norwegian farmers. This comes in addition to the very small size of the Norwegian biotechnology sector. In turn, the costs of following scientific advice and the dominating knowledge claims are not very high in this case. This leaves us with even more reason to follow future developments in this issue area with great interest.

The high number of rejections may primarily be associated with the very low level of malignancy in Norway, while the increase in robustness and more detailed argumentation may be explained by learning and a growing acceptance of the precautionary principle in this sector. In fact, the precautionary principle seems to have higher level of acceptance by the general public than with the government. Reports and recommendations from official governmental sources (the Food Authorities, the Norwegian Scientific Committee for Food Safety, and the Walløe Commission) show less focus on this principle. The GMO issue provides a prime example of the dilemma of regulators, in seeking to skirt the dangers of being co-opted by technocrats with too little democratic control, as portrayed in the scenario of Barnett & Finneman, or on the other hand, leaving the agenda to be shaped in populist terms solely. From another angle, we may say that Norwegian regulators will be hard pressed in the final round when faced with the dilemma of having to choose between disappointing a unified public opinion that includes a wide range of Norwegian interest groups, and going against the trends and expectations of the European Union.

Appendix 1

Explanation of numbers in columns

a) Environment –the numbers in this column indicate one or more of the following uncertainties concerning:

1 Cross-pollination and horizontal spread, including resistance in target species and genetic erosion
2 Effects on non-target species (e.g. monarch butterfly)
3 Tracing and labelling
4 Precautionary principle
5 Effects on herbicide use (has it been reduced or not?)
6 Antibiotic resistance
7 Liability
8 Co-existence

b) Health – the numbers in this column indicate one or more of the following uncertainties concerning:

1 Allergies
2 Digestive effects (digestive breakdown of active enzymes etc)
3 Antibiotic resistance
4 Toxicity

c) Social – the numbers in this column indicate one or more of the following uncertainties concerning:

1 Societal utility
2 Changes/growing social inequity
3 Reduced opportunity to reuse seeds for farmers (due to hybridisation)
4 Ethics and sustainable development: In the early phase (1993–1998), this argument generally indicated a lack of documentation of the effects on use of chemicals (i.e. same as environmental concern no. 5) in the growing of GM plants. In later phases (2003–2005), these concepts are used in a wider sense, including effects on global agricultural structures and North–South issues of equity.

Date	Name of application	Applied use	Environ-ment [a)]	Health[b)]	Social[c)]	Votes in NBAB	Norwegian result
16.12.05	Corn EFSA/NL/05/12	Food & fodder	1, 2(4)	1, 2	4	No	?
16.12.05	Corn EFSA/UK/05/11	Food & fodder	1, 2(4)	1, 2	2, 4	No?	?
11.11.05	Cotton EFSA/NL/05/13	Import, food	1	–	1, 4	No	?
12.10.05	CottonEFSA/NL/05/163rd	Import, seeds	1	1	1, 4	No	?
02.09.05	Corn EFSA/UK/04/01	Food & fodder	1, 2, 3	2	1, 3, 4	No	?
02.05.05	Carnations C/NL/04/02	Import	3	–	2	No	?

Date	Name of application	Applied use	Environ-ment [a)]	Health[b)]	Social[c)]	Votes in NBAB	Norwegian result
18.03.05	Cotton C/NL/04/01 2nd	Import, seeds	1, 2	–	1	No	?
18.03.05	Corn EFSA/UK/04/06	Food & fodder	6	3		No	?
18.03.05	Corn EFSA/BE/04/07	Food & fodder	6	3		No	?
24.02.05	Corn C/ES/00/01	Fodder			1, 4	1/15	?
13.01.05	Potato C/SE/96/350	Import, grow	6	3		No	?
06.12.04	Rape C/BE/96/01 2nd	Import, food	1	–	1, 4	No	?
05.12.04	Cotton C/NL/04/01 1st	Import, seeds	2		1, 4		?
05.11.04	Corn EFSA/NL/04/02 3rd	Food	2, 3	1, 2	2, 4	No	?
07.05.04	Corn C/GB/02/M3/3	Import, food	1, 2, 3	n.e	1, 4	No	?
03.05.04	Corn C/ES+NL/01/01 2nd	Growing	1, 2, 7	–	–	No	?
23.04.04	Rape C/BE/96/01 1st		1, 8	4	1, 4	No	?
19.03.04	Rice C/GB/03/M5	Import, prod	1, 2, 3, 7	n.e	1, 2, 4	No	?
08.04.03	Rape C/NL/98/11	Import, food	1, 3, 4	4		No	No
10.10.03	Corn C/ES+NL/01/01) 1st	Grow, fodder	1, 2, 3, 7	1, 2, 4	1	No	No
30.09.03	Rape C/NL/98/11 2nd	Import, prod	1, 2, 3		1, 4	No	No
08.04.03	Corn C/ES/00/01	Import, food	3	1, 2, 4	1, 4	No	No
19.11.01	Corn C/ES/98/01	Fodder	1			No	No
19.05.00	CarnationC/NL/97/12+13	Import	1		1, 4	8/8	Yes

Date	Name of application	Applied use	Environ-ment [a)]	Health[b)]	Social[c)]	Votes in NBAB	Norwegian result
05.08.99	Rape C/DE/98/06	Import, grow	1, 4		1, 4	No	No
05.08.99	Corn C/F/96/05-10	Import, grow	1, 2			No	No
13.07.99	Aspen (UiTr)		6				Yes
06.06.98	Potato C/NL/96/10	Import, grow	6			1/15	No
09.02.98	Tomato C/ES/96/01	Import, grow	6			5/10	No
09.02.98	Cotton C/ES/97/02	Import, grow	1, 2, 6			5/10	No
09.02.98	Cotton C/ES/97/01	Import, grow	1, 2, 6			5/10	No
28.09.97	Potato C/NL/96/10	Import, grow	6			4/11	No
29.09.97	Carnation C/NL/96/14	Import	1			14/1	Yes
28.11.97	*Beta vulgaris*C/DK/97/01	Import, grow	1, 5	4	1, 4	5/12	No
30.01.97	Rape C/DE/96/5	Import, grow	1, 5		4	8/7	?
04.07.96	Rape C/UK/95/M5/1	Import, fodder	1, 3, 5, 6		4	No	No
05.07.96	Corn C/F/95/12/02	Import, grow	1, 5, 6		4	+/(–)	?
15.11.96	Chicory C/NL/94/25-A	Import, grow	3, 6			7/9	
17.10.96	Corn C/F/95/12-01/B	Import, grow	1, 5, 6	3	4	7/10	?
29.08.96	Microorg C/FI/96/1NA	Import, test	6			11/6	No
05.10.95	Rape C/F/95/05-01/A	Import,	1, 3, 5, 6		4		No

Date	Name of application	Applied use	Environ-ment [a)]	Health[b)]	Social[c)]	Votes in NBAB	Norwegian result
		grow					
27.06.95	Soy C/UK/94/M3/1	Import, food	3		4	Yes	No
19.06.95	Chicory C/NL/94/25	Import, grow	3, 6			Yes	No
12.05.95	Corn C/F/94/11-03	Import, grow				10/2	No
30.09.94	Tobacco C/F/93/08-02	Import			4	No	Yes
30.09.94	Rabies vaccC/B/92/B28	Import	2	4		(+)/–	No
30.09.94	Aujeszky vaccC/D/92/I-1	Import	1, 5			No	No
08.07.94	Rape C/UK/94/M1/1	Import, grow	1, 5	4	4	No	No
13.04.94	Tobacco, NLH	Grow				Yes?	
03.03.94	Aspen, NISK	Grow				+/(–)	

Notes

[1] The project has been supported by the Norwegian Research Council. Thanks to Steinar Andresen, Lars Gulbrandsen, Peter Johan Schei, Jon Birger Skjærseth, Olav Schram Stokke and Jørgen Wettestad for valuable comments during the process of preparing this report. Any remaining errors are the sole responsibility of the author.

[2] Genetically Modified Organisms (GMOs) can be defined as organisms in which the genetic material (DNA) has been altered in a way that does not occur naturally by mating or natural recombination.
http://europa.eu.int/comm/food/food/biotechnology/index_en.htm

[3] www.cbd.int/biosafety/issues/risk.shtml

[4] www.cbd.int/biosafety/faqs.shtml?area=biotechnology&faq=6

[5] A central example – which is politically and scientifically controversial – is found in Mexico, where genes from transgenic maize were found to have wandered into native maize populations (Quist & Chapela, 2001).

[6] www.cbd.int/biosafety/faqs.shtml?area=biotechnology&faq=5

[7] Directive 2001/18 is a revision of former Directive 90/220.

[8] Based on the presentation by Ole Kristian Fauchald, Conference on Ecological Risks and Precaution in the Nordic Countries, May 2005, Faculty of Law, University of Oslo.

[9] See Lieberman & Gray (2006) on how the beginning and ending of the 1998–2004 de facto moratorium was never legally enacted by the EU.

[10] Tracing and labelling are primarily aimed at consoling concerns for human health; there are still unresolved environmental problems related to co-existence between GM plants and conventional and organic farming, as well as regarding liability.

[11] *International Environmental Reporter,* 2006, 29 (20): 744, article referring to EU trade spokesman Peter Power.

[12] Point 9 in the preamble.

[13] The process may be prolonged with another 45 days if members come up with questions for additional information from the applicant.

[14] The moratorium was brought to a partial end through the approved import of Syngenta's Bt11 maize (GM pest resistant) – for sale as tinned sweet corn, not for growing, 19 May 2004.

[15] The Ministry of Health, in collaboration with the Directorate for Health and Social Affairs, is responsible for the contained use of GMOs in Norway.

[16] *Planet Ark*: 'Factbox – Key findings in WTO ruling on GMOs', 9 February 2006. www.planteark.com/dailynewsstory.cfm/newsid/34989/story.htm

[17] *Europolitique environnement*, 6 October 2006, No 709, vol. 34, p.1. 'European stance on GMOs condemned by the WTO.'

[18] The figures, reflecting each sub-concern, are given in the table (appendix 1) in order to show how these arguments have evolved and been used over time.

[19] As yet another corollary to this understanding, Irwin (2004) points out that it is problematic to focus on regulations at the national level when technologies are decidedly global in origination and application. 'Decisions taken elsewhere by international industrial organisations (with Monsanto as the obvious example) can effectively remove the possibility of nations going GM free (e.g. by mixing GM and non-GM foodstuffs at source)' (Irwin 2004: 63). This supports the contention that Norway's assessment procedures are likely to be affected by the parallel processes in the EU. Accordingly, I started out with a brief look at the trends in the EU and also included this line of inquiry in my interviews.

[20] 'Regjeringen Bondevik avviser regjeringen Stoltenbergs forslag om å innlemme Bioteknologinemnda i

det nye sosial- og helsedirektoratet'. (Statsbudsjettet 2002. Forskning og høyere utdanning i budsjettproposisjonen for 2002.)

[21] www.forskning.no/Artikler/2004/juni/1087302430.29/artikkel_print accessed 15 December 2006.

[22] Interview with NBAB representative, Norwegian Society for the Conservation of Nature, 21 June 2006.

[23] Interview with member of the NBAB Secretariat, 5 May 2006.

[24] Letters of 27 January and 17 March 2005.

[25] Letter of 13 April 2005.

[26] Interview with representative of Norwegian biotechnology association, 4 August 2006.

[27] The decision came as a response to Stortingsmelding (White Paper) 40, 1996–97 ('Matmeldingen').

[28] Interview with NBAB representative, Norwegian Society for the Conservation of Nature, 21 June 2006.

[29] The EEA Committee takes the decision on whether new Community legislation is of EEA relevance, with joint participation by the EU Commission

and the EEA-EFTA member states. For instance, in the discussion on the use of the precautionary principle in food safety, some of the concerns of the Committee were found in the EU documents as well. In Norway, the representatives may state their opinions, but there is no voting in the committee. Nor is the government obliged to follow the opinions stated in this body. The government may make its own conclusions before the meetings in Brussels (Melsæther & Sverdrup, 2004).

[30] Interview with representative of the Norwegian authorities, Ministry of the Environment, 24 August 2006.

[31] Interview in the Norwegian Biotechnology Board, 26 September 2006.

[32] Interview with representative of the Norwegian authorities, Ministry of the Environment, 24 August 2006.

[33] The parties to the Århus Convention have agreed to extend the treaty's rules on public participation to all government decisions involving the release of GMOs (ENDS 2005). In particular, governments are to make available 'in an adequate, timely and effective manner' a summary of the request for authorisation for the release or marketing of GMOs *(International Environmental Reporter,* 28(12):399.)

[34] The author has had the opportunity to examine the documentation following one such application (confidential). This application has 55 references. Of these, almost half are references to official documents, such as general OECD reports and guidelines, none of which has any direct reference to the case in point. Another third of the references are drawn from the company's own research units and cited as 'unpublished technical report'. Only in two instances may these have any direct bearing on the GM plant for which the application is sought, most are outdated or focus on other species. There are 21 references to peer reviewed books or articles. However, only five of these are recent enough to have any bearing on present day technology, all of them are restricted to deal with allergies and human health issues, and none concern environmental aspects of the GM plant in question.

[35] 'There is one meter of documentation and still we miss important aspects, such as information about vitamin content. We cannot accept to be overwhelmed by irrelevant information when what we need is relevant information.' Interview, 26 September 2006.

[36] A recent study indicates that greater knowledge is likely to engender more positive public attitudes towards GM technology, but not towards GM food (Verdurme et al., 2003).

[37] www.pioneer.com/web/site/portal/menuitem.cc20eec90551c318bc0c0a03d10093a0/ accessed 29 March 2007.

[38] www.bayer.com/en/1996-2006.aspx accessed 29 March 2007.

[39] www.aventis-foundation.org/_de/tenyears/meilensteine/index.html accessed 29 March 2007.

[40] www.novartis.com/about-novartis/company-history/1company.shtml accessed 29 March 2007. www.syngenta.com/en/about_syngenta/timeline.aspx accessed 29 march 2007.

[41] Press release, 14 October 2006:'Nei til genmodifisering av norsk landbruk' (No to gene modification of Norwegian agriculture). Open letter on gene modification of Norwegian agriculture, to the Ministries of Agriculture, Ministry of the Environment, the Stortinget's Standing Committees on Commerce and Industry, and on Energy and the Environment. Oslo, 4 October 2006.

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