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DEEPENING A PRECAUTIONARY EUROPEAN POLICY

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ABSTRACT. In regulatory practice, the principle of precaution is hardly linked to the ideal of sustainable development. In this article, we argue that it should be. We argue that sustainable development is the *sense* of an ethics of co-responsibility, while precaution is the *attitude* needed to realize this sense. From this perspective, we comment on some regulatory practices within the European context regarding authorization requests for deliberate releases of genetically modified crops and show some problems that are popping up there, for example, the difficulties in interpreting the meaning of "harm" (and of "benefit"), the symptomatic gap between regulatory rule and political practice. Finally, we suggest that, in order to respond to such problems, precaution should find an appropriate translation in the fields of both research and innovation policy, of authorization policy and of economic policy.

KEY WORDS: Co-responsibility, precaution, public policy, sustainable development

ABBREVIATIONS: EEA – European Environment Agency, GMC – Genetically Modified Crop, GMO – Genetically Modified Organism, FRDO – Federal Council for Sustainable Development (Belgium), IMSA – Institute for Environment and Systems Analysis (the Netherlands), INRA – National Institute for Agricultural Research (France), NBC – National Biosafety Commission (Spain), NGO – Non-Governmental Organization, R&D – Research and Development, SBB – Section on Biosafety and Biotechnology (Federal Health Institute, Belgium), STEM – Research Centre for Technology, Energy and Environment, SPIRE – Science and Precaution in Interactive Risk Evaluation, WTO – World Trade Organization.

1. INTRODUCTION

The precautionary principle has a European history of about four decades now (O'Riordan and Cameron, 1994). During this period, many authors complained about its ambiguous and vague meaning (Bodansky, 1991; Dovers and Handmer, 1995; Morris, 2002; Starr, 2003), and many texts were written in order to make its meaning more concrete and, consequently, to make the concept operational in a more unequivocal way (O'Riordan and Cameron, 1994; Raffensperger and deFur, 1999; Sandin, 1999; Treich, 2000; Calman and Smith, 2001; Haag and Kaupenjohann, 2001; O'Riordan et al., 2001; DeKay et al., 2002; Löfstedt et al., 2002; Mayer and Stirling, 2002; Sandin et al., 2002; Van den Belt and Gremmen, 2002; Henry and Henry,

2003; Ricci et al., 2003; Tickner, 2003). In most of these texts the link between precaution and sustainable development remains unclear or is even absent.

In this article, we argue, first, that precaution should be explicitly related to sustainable development. And we investigate how this relationship influences the meaning of the precautionary principle. In a second part, we analyze interpretations of the precautionary principle as we find them in European and Belgian regulatory texts and practices. In a final part, we offer some recommendations for a public policy that is precautionary in a deeper sense, i.e., in the sense of sustainable development.

2. PLACING THE PRINCIPLE OF PRECAUTION IN CONTEXT

According to Boehmer-Christiansen, the German concept of *Vorsorge* integrates three meanings: caring for, worrying about, and obtaining provisions (Boehmer-Christiansen, 1994). In order to help us clarify the concrete meaning of each of these verbs, we could start with a reflection on the following questions. Should the choice of newly developed technological applications be subordinate to predefined goals, or should the choice of the goals to be realized be subordinate to already developed technological applications? Should the freedom of producers and consumers be subordinate to commonly shared visions on humane conditions of existence both for present and future generations, or should present and future conditions of existence be subordinate to the maximum freedom – even in the sense of a just distribution between present and future generations – of producers and consumers? Answers to these questions cannot be of a black-or-white type. For, to start with, it does not make so much sense to define abstract societal goals that are hardly connected to (presumed) technological possibilities on the one hand. And new technological applications are not developed in complete independence from already existing societal goals on the other hand. There always exists some reciprocity between (dominant) societal goals and (dominant) technological developments. Something comparable holds for the relationship between consumers' and producers' freedom and visions on humane conditions of existence. The kinds of freedoms that get legally protected and (dominant) interpretations of humane conditions of existence are influencing each other mutually. Both questions rather express a need to make these reciprocities and mutual influences more explicit and to create, as a consequence, possibilities to adjust them.[1] This need is illustrated by the many controversies – both scientific and societal – that exist concerning societal introductions of new technological applications

[1] See also Goorden (2003).

It is a worldwide phenomenon that introductions of new technologies give rise to a lot of scientific and societal controversies. The acceptance of Precaution as a European policy principle can be seen as a confirmation by national and European public authorities of the relevance of these controversies, given a growing awareness of the possibly huge impacts of new technologies – both positive and negative. In our view, these controversies testify to a need to recalibrate the choices and values embedded in these technologies on the one hand and visions and concerns of the wider public on the other. What makes this recalibration exercise unavoidable? And what is the aim of it?

2.1. *Responsibility for the Future*

The reason why this recalibration exercise has to be done, according to Jonas, is because of the technological capabilities present in our modern Western societies (Jonas, 1984). Contrary to pre-modern times, human technological and scientific powers are such that the natural conditions of human existence can be altered, either gradually or suddenly. Nature – both the nature of living beings and their environment – proves to be susceptible to the interferences of modern technologies. Our climate shows changes due to the use of greenhouse gases and fossil fuels. (Agro-)industrial practices threaten existing biodiversity. The use (or misuse) of nuclear energy – either for applications during peace or war times – threaten the genetic codes of living beings. We are capable of radical changes, both in the short and the very long run and both locally and globally. And because we are capable, we are responsible. It is the dimension of modern, industrial technological powers and the possible threats they entail for the natural conditions of human existence that make a recalibration between the values and choices inherent in technological applications, on the one hand, and human concerns and expectations, on the other, unavoidable.

From now on, according to Jonas, acting technologically is acting in an ethically sensitive way. Our responsibility for humans urges us to take responsibility for nature, since human conditions of existence depend on it. However, this responsibility does not any longer remain restricted to what happens here and now, because the – often unpredictable, cumulative and irreversible – effects of our technological actions extend widely in time and space. Our responsibility is, therefore, a responsibility for the future arising from our collective technological acting.

2.2. *Responsibility for the Future as Culpable Ignorance*

This responsibility is, moreover, rather handicapped, for our technological power for acting largely goes beyond our scientific power for predicting the effects thereof and our moral power for judging them. Ian Hacking's

concept of "culpable ignorance," nevertheless, prevents an easy evasion from our responsibility because of this handicap (Kaiser, 2003, p. 43). The responsibility connected to the Principle of Precaution is an example of "culpable ignorance." "The precautionary principle implies the need, as a matter of cultural change, for society's institutions to enlarge existing notions of ethical responsibility to encompass these unknowns, which are predictable in principle even though not in specifics"'(Harremoës, 2002, p. 215).

2.3. *A Rupture?*

Jonas does not convince us completely. We admit that the scope of modern technological effects on the natural conditions of human existence, both in time and in space, is many times larger than it was before. This conclusion, however, does not justify the radical rupture Jonas seems to draw between modern and less modern technologies. In his view, modern technologies are ethically sensitive, while previous ones are not. In our view, not only modern technological applications can induce societal discontent. Throughout human history we can find examples of technologies that had very negative effects on the conditions of existence of particular groups in society. Admittedly, these conditions of existence are often no less related to social than to natural circumstances. We see, however, no reason why our technological capability of changing social conditions is less important than our technological capability of changing natural conditions. Both capabilities (or both dimensions of our capabilities) can induce the need for a recalibration between technological applications and societal expectations. Both capabilities imply responsibilities.

2.4. *The Relevance of the Economic Context*

And sure, the social or natural effects of a technological application are not necessarily intrinsically connected with the technology itself. The economic context in which and the economic objectives for which a specific application is selected and put into action can often (help to) explain the extent and gravity of its effects. Not so much our technological acting, but our technological acting within a particular economic context is an ethically sensitive acting. The need for a recalibration exercise thus rather emerges from a lack of adjustment of the norms and values embodied in the economic freedoms to select and implement particular technological applications on the one hand and (considered) societal norms and values on the other.[2]

[2] See, for instance, the recent FAO report *The State of Food and Agriculture 2003–2004* (http://www.fao.org/docrep/006/Y5160E/Y5160E00.HTM; date of consultation: 27/05/04).

2.5. *Sustainable Development as the Sense of the Recalibration Exercise*

According to Jonas, the sense of a recalibration exercise is to safeguard the humanity of the conditions of existence of both present and future generations. Maintaining humane conditions of existence (in the near and far future) has become a decision criterion for our technological acting. This responsibility is total, continuous, and future-oriented.

We are totally responsible: not only for the material needs, but for everything that enables human beings to develop in a humane way (knowledge, social and moral skills, practical and cultural skills, societal structures, and so on). Human beings are, indeed, in the first place responsible for the ability of other human beings to bear (in due course) their own responsibility and to give shape to their own humaneness.

We are continuously responsible: our responsibility never stops. Our responsibility has a historical dimension: it relates the past with the present and the future. It recognizes what has been handed down – both positive and negative deeds, both failed and performed actions – and asks itself how to integrate them in the future of the people who will live in the future. It regards the tradition of a collective humane identity.

We are in the first place responsible for the future. A paradox is at the back of this. We are responsible for a future that escapes the effectiveness of our actions. For the results of our actions are unpredictable. They escape our control. We cannot be responsible for the concrete deeds of future generations. For this is precisely the aim of our responsibility towards the future: we should not so much fix the future, but create the conditions so that those living in the future will be able to create their own concrete lives and to bear responsibility for their own future.

We could apply a more recent terminology to Jonas's ethics of responsibility: the sense of a recalibration exercise is Sustainable Development. The responsibility emerging from our technological possibilities regards the realization of sustainable conditions of existence. This responsibility does not remain restricted to the natural/environmental dimensions of human conditions of existence. It regards no less their social and economic dimensions.

2.6. *A Public Ethic*

The ethics of responsibility for Sustainable Development belongs to the sphere of public policy, not so much to the private sphere of human relationships. It applies to the collective acting of humans because of the possible effects of this collective acting on the continued existence of humanity. This interpretation sounds like an anachronism. We are not used any more to think of public authorities as moral entities. We are rather used

to interpret public authorities as utilitarian institutions that should defend the safety of their citizens, but without interfering with the (predefined) freedoms of producers and consumers (compare with Calman and Smith, 2001, p. 193).

2.7. *An Ethic of Co-responsibility*

The ethics of responsibility for Sustainable Development is, moreover, an ethics that should be publicly defined or, in the words of Mitcham and von Schomberg (2000), an ethics of collective co-responsibility.[3] In order to make the concept of Sustainable Development concrete with regard to technological developments, public debates are needed. Individual scientists, engineers, and experts cannot take responsibility for their discoveries and engineering designs, because these discoveries and designs get transplanted into the subsystems of economy, politics, and law and, hence, transformed according to the specific logics of these subsystems. These system logics are not traceable to the intentions of particular individuals, nor are the possible, but unintended and often not assessable consequences of the transplanted and transformed scientific and technological applications.

Therefore, all citizens should respond personally. Personal responsiveness means that individual participation in public debates is the default position: persons must give reasons for being excused from such a duty. Public deliberation serves the function of presenting different relevant issues to the more or less autonomous systems and subsystems of society, i.e., to politics, law, science, and so on. Appropriate exchanges between the various subsystems and the wider public are needed. Representatives of these subsystems need to respond to publicly identified and articulated issues. Conversely, they are drivers for new debates when they publicize particular aspects of an issue that cannot be fruitfully resolved within the limits of the typical specialized discourse of the subsystem they belong to.

2.8. *Sustainable Development is the Sense, Precaution is the Attitude*

Sustainable Development is the *sense* of our responsibility; Precaution is the *attitude* that is necessary in order to realize it.[4]

Why do we need to be precautionary? New technological applications place us before ever new situations. Consequently, in order to judge these

[3] Karl-Otto Apel developed the idea of an ethic of co-responsibility. Contrary to Jonas, who grounds his ethics of responsibility in a teleological metaphysics, namely the integrity of nature, Apel grounds it in discourse ethics (Lin, 2003, pp. 18–50).

[4] See also Dommen, E. (ed.) (1993). *Fair principles for sustainable development. Essays on environmental policy and developing countries.*

new situations, we cannot fall back on previous experiences. If our scientific predicting power were reaching as far as the causal scope of our technological acting, we would not need to be precautionary. This is, however, not possible. And this is, according to Jonas (and Arendt), not a completely new phenomenon. Scientific predicting power is by definition not adequate with respect to political acting: the spontaneity typical for political acting makes it ''irrational'' from a scientific perspective. The possibly huge scope, both in time and space, and irreversibility of the effects of new technologies add, however, a new dimension. We are aware that present-day technological applications can possibly disturb the human conditions of existence thoroughly and without leaving us the opportunity to regain control. It is this dimension that urges us to take responsibility in a precautionary way.

What does such a precautionary attitude stand for? Since Precaution is an attitude needed to realize Sustainable Development, it should be translated into goal-oriented procedures.[5] In a goal oriented approach Precaution plays its part during the whole process of selecting public goals and feasible alternatives. It does not only come in when there is sufficient evidence that a certain activity or technological application turns out to be sufficiently harmful. The central question is, which range of activities is feasible and acceptable to reach a specific goal? Considering a sufficient variety of alternatives in function of a predefined goal influences the quality of risk evaluations in a positive sense. Less reason exists to avoid uncertainties. It is important to make our uncertainties and ignorance – emerging from the lead of our technological power on our scientific predicting power – explicit with dedication of all the scientific knowledge and skills we have. However, every alternative is considered and the evaluation is not restricted to an evaluation of risks and uncertainties. The appraisal of possible advantages is as important. In addition the concept ''evaluation'' gets a wider sense. Not only the effects for the environment or for human health are relevant for the goal aimed at, but also social, cultural, political, economic, aesthetic, and distributive effects. The final decision regards the choice of the most promising alternative (or the most promising set of alternatives) in function of the goal aimed at. In this sense, a goal oriented approach stimulates technological innovation. A goal oriented approach presupposes a continuous learning process, for scientists concerned as well as for citizens and policy people. Since the implementation of various alternatives involves many uncertainties, a continuous monitoring of effects is necessary. Some alternatives can be

[5] Mary O'Brien distinguishes between a goal-oriented and a harm-oriented precautionary approach (O'Brien, 2003).

more and others less harmful than initially expected. Or it can turn out that one urgently needs to look for new alternatives. Cooperation from all sides of a society and transparent participatory political processes are a condition to achieve public environmental and public health goals.

To summarize, precaution as an attitude in the service of Sustainable Development implies (a) the definition of concrete goals and a variety of technologies and practices that can contribute to these goals, (b) a comparison between technologies and practices regarding their respective environmental, social, economic risks and benefits, (c) deliberative processes in order to integrate public concerns and visions into the definition of goals, the definition and monitoring of risks and benefits, and the decision-making concerning a feasible and desirable variety of technologies and technological practices, and (d) an iterative process.

3. A COMPARISON OF INTERPRETATIONS

Differences between the precautionary policies of Europe and the US generate trade disputes, for example with regard to genetically modified crops and food. One can, however, doubt whether these disputes relate to different interpretations of the Precautionary Principle as such or to its application with regard to particular products and technologies in particular cultural, legal, political, and economic contexts. Both Jasanoff (2003) and Wiener and Rogers (2002) question the conventional wisdom that sees the European Union as endorsing the Precautionary Principle and proactively regulating uncertain risks, while the United States opposes that PP and waits for evidence of harm before regulating. According to Wiener and Rogers, who investigated several cases – hormones in beef and milk production, mad cow disease in beef and blood donations, genetically modified foods and crops – precautionary attitudes of both Europe and US vary enormously. ''Neither the EU nor the US can claim to be categorically 'more precautionary' than the other. The real pattern is complex and risk-specific'' (Wiener and Rogers, 2002, p. 317).

Jasanoff pleads for a resurrection of the Precautionary Ideal in the context of the US (Jasanoff, 2003, pp. 236–239). We argue that her recommendation is also valid for the European context and, moreover, in line with the interpretation of the Precautionary Principle that we suggest, namely precaution as a particular attitude in the service of Sustainable Development.

In this section, we will analyze applications of the Precautionary Principle as they emerge in European regulatory texts and practices (and in

assessment practices of the Belgian Biosafety Council).[6] We will investigate to what extent these applications show the various characteristics we analyzed as being important. We analyzed precaution as an attitude with some substantial characteristics: it takes (a) predefined goals as its starting point, (b) defines technologies and technological practices in function of these goals, and (c) evaluates and compares the risks and benefits of this variety of suitable technologies and practices with regard to both their environmental, ethical, social, and economic impacts. Precaution is, moreover, an attitude with some procedural characteristics: it is (a) a continuous learning process, (b) that integrates public concerns and visions during the whole process, and (c) that takes the economic context with its particular power relationships into consideration.

3.1. *Discrepancies Between Regulatory Documents and Regulatory Practices*

In the European regulatory context, the Communication of the European Commission on the Precaution Principle (COM, 2000) is an important policy document.[7] This Communication places the precautionary principle within the existing framework of risk analysis (Löfstedt, 2004, p. 246). ''Application of the precautionary principle is part of risk management, where scientific uncertainty precludes a full assessment of the risk and when decision makers consider that the chosen level of environmental protection of human, animal and plant health may be in jeopardy'' (COM, 2000, p. 13).

The communication starts from the assumption that the Precaution Principle is, initially, a management principle that is triggered when potentially dangerous impacts of a phenomenon, product, or process are stated and a scientific evaluation cannot determine the risks with sufficient certainty. The latter condition implies that a scientific evaluation that is as complete as possible and that explains the degrees of uncertainty connected to it is a precondition to take precautionary measures. The communication reminds that the risk perception inducing a scientific evaluation is rather of a practical than a theoretical kind. It stresses, further, that a precautionary decision is in the last resort a political decision and that its correctness depends on the societal acceptability of the risks society will have to bear.

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[6] Because of the experiences the authors of this article have with some Belgian regulatory practices, either as a member of a scientific advisory committee to the Biosafety Council, or through the Science and Precaution in Interactive Risk Evaluation (SPIRE) research project (see for more information on this research project www.ua.ac.be/SPIRE).

[7] From now on we will refer to this document as ''the Communication.''

The guidelines for application that are proposed in the communication on precaution are proportionality, non-discrimination, coherence, considering costs and benefits of both acting and non-acting, considering scientific developments. These guidelines are comparable to the ones that should be applied when other – rather preventative than precautionary – management measures are to be taken.

The European Environment Agency produced a report entitled *Late lessons from Early Warnings* that provides, with the help of several case studies, justification for the use of the precautionary principle. In this report, however, the European Commission's interpretation of precaution as a risk management principle is questioned. The report stresses that regulators should,

- "ensure use of 'lay' and local knowledge, as well as relevant specialist expertise in the appraisal
- ensure that real world conditions are adequately accounted for in the regulatory appraisal
- take full account of the assumptions and values of different social groups
- avoid 'paralysis by analysis' by acting to reduce potential harm when there are reasonable grounds for concern" (EEA, 2001, pp. 168–169 cited in Löfstedt, 2004, pp. 247–248).

According to Löfstedt one can question whether recent EU rulings actually abide by EU's communication (Löfstedt, 2004, pp. 248–249). Both the EU Chemical White Paper and the European Commission Consultation Document on Chemical Regulation call for substances that are persistent, bio-accumulative or known endocrine disrupters to be subject to authorization, in effect leading to a general ban on substances deemed very high concern. This illustrates that Europe deems the use of the precautionary principle justified even without backing from scientific committees. Similarly, two important legal rulings by the Court of First Instance reaffirmed that precaution should not always be interpreted as part of a risk assessment. These cases arose from a 1999 EU regulation banning antibiotic additives in animal feed on the basis that bacterial resistance to antibiotics might be transferred to humans (though there was no reputable scientific evidence that there was such a transfer).

Comparable discrepancies between regulatory documents and practices are obvious with regard to authorization procedures for GMO releases. The European Communities' Deliberate Release Directives 90/220 and its successor 2001/18 were designed to manage scientific and political uncertainty about hazards of genetically modified organisms. These Directives are implicitly precautionary as far as they regulate *a priori* entire categories of products for which there was no prior evidence of harm (Levidow, 2001,

p. 849). They are explicitly precautionary as far as they declare the precautionary principle as their first priority. Precaution, then, means that intended releases should be assessed case-by-case and step-by-step and that this assessment should be based on expert advice concerning the biosafety, i.e., safety for human health and for the environment (including biodiversity), of the release at stake. The scientific character of the assessment is intended to contribute to an objective and harmonious treatment of the dossiers. Objective and harmonious procedures should support and stimulate scientific research and innovation, avoid unequal conditions of competition, eliminate impediments – between and within EU countries – while developing and bringing onto the market products containing GMOs (Mayer and Stirling, 2002, p. 58). They should, moreover, provide GMO firms with a transparent legal and administrative frame.

Directive 2001/18/EC provides, further, general guidelines concerning the ethical and social aspects of deliberate releases. The ''European Group on Ethics in Science and New Technologies'' may be consulted in order to obtain advice on ethical issues of a general nature. Member States of the EU retain, moreover, a competence of their own as regards ethical issues (COGEM, 2003, p. 19). The latter statement remains, however, to a certain extent a dead letter, partly because the European member states that are willing to integrate social and ethical issues are still trying out suitable procedures (e.g., the Netherlands), partly because most of the member states doubt the sincerity of this statement, since concrete substantial and/or procedural recommendations are lacking.

Social conflict within many European member states has been preventing a straightforward application of European GMO Directives. The lifting of the moratorium established at a European level in 1998 is still in coming.[8] Some national Biosafety Commissions shifted their regulatory practices to a certain extent in response to public opinion. In Spain, for instance, the NBC (National Biosafety Commission) uses input from public debate to assess certain public concerns even if it does not form part of its own formal risk assessment protocol (Todt, 2004, pp. 150–151). The NBC's formal risk assessment protocol requires the evaluation of the pathogenicity, genetic stability, dissemination and survival of GMOs, effects on other organisms and gene transfer. Informally, however, it evaluates a number of additional health and environmental issues raised by NGOs in the public debate, for instance, the use of marker genes resistant to antibiotics, the development of resistance in pests to insect resistant crops as well as the effects of these crops on populations of beneficial (non-target) insects, and issues related to herbicide use.

[8] Environment Daily 1671 (19/05/2004); Environment Daily 1689 (17/06/04).

Moreover, the NBC applied, in a few isolated cases, an implicit technology assessment. Although the scope of the European GMO Directives is limited to evaluating health and environmental effects and deciding about the acceptability of those effects, the NBC assessed, for instance, the overall impact on herbicide use of herbicide resistant crops. It, thus, assessed the expected benefits and compared them to possible risks or costs. Further-reaching demands, like the evaluation of the technology's socio-economic effects, its impact on traditional agriculture or its effects on the North–South relationship, are, however, still excluded by the Commission from the evaluations (Todt, 2004, p. 156).

In Belgium, the Biosafety Advisory Council is responsible for assessing authorization requests for deliberate releases of GMOs (http://www.biosafety-council.be). The Section on Biosafety and Biotechnology (SBB) of the (federal) Institute of Public Health acts as the secretariat of the Council (http://biosafety.ihe.be). The SBB watches punctually that the discussions taking place in the scientific committees advising the Biosafety Advisory Council conform to European and Belgian regulations. With regard to the dossiers we analysed in 2002, for instance, the chairperson cut short discussions concerning the scientific and societal use of the intended GMO releases and their possible damage for organic agriculture. The Biosafety Advisory Council gave a positive advice to all of the six new authorization requests for field trials it received in 2002. The Competent Authority, however, admitted only four of them, thereby responding to concerns of the wider Belgian public. It created, thus, a discrepancy between Belgian regulatory guidelines and regulatory practice. During 2003 and 2004, hardly any authorization requests for deliberate releases were submitted in Belgium. The enterprises lost their confidence in existing authorization processes. In the Belgian context – as in the context of other European member states – the European intention to install a precautionary procedure for the treatment of authorization requests that results in transparent and consistent decisions failed. Apparently, precautionary procedures that are based on a scientific assessment of the biosafety of intended releases do not suffice.

As we will show in the following sections, reasons for this failure are (1) that precaution is not linked to predefined goals, (2) that application of precaution depends on a particular technological application, rather than the other way round, (3) that society perceives more risks and less benefits than the official European precautionary attitude allows to, (4) that the demand for consistency contradicts the idea of precaution as a continuous learning process, (5) that the wider public is, until now, not seriously involved in the definition of sustainability goals, risks and benefits, and a suitable variety of technological applications, and, last but not least (6) the

European public distrusts the economic (and political) powers that push forward present biotechnological innovations.

3.2. *Precaution and its Substantial Orientation*

The Bergen Ministerial Declaration states, ''In order to achieve sustainable development, policies must be based on the Precautionary Principle. Environmental measures must anticipate, prevent and attack the causes of environmental degradation. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation'' (Declaration of the United Nations Economic Commission for Europe, May 1990, as cited in Sandin, 1999, p. 903). This declaration suggests that there is an obvious link between (the environmental dimension of) sustainable development and precaution, namely that a sustainable environment cannot be reached without a precautionary attitude. We argue that the Precautionary Principle, as it emerges in the European Communication,[9] has been unlinked from the (environmental dimension of the) ideal of sustainable development.

3.2.1. *Predefined goals as the starting point for Precaution?* According to the Communication, the Precautionary Principle should aim at a balance between the freedoms and rights of persons, enterprises, and organizations on the one hand and the necessity to limit the risks of negative impacts on the environment and the health of humans, animals, and plants on the other (COM, 2000, p. 1). As Jensen argues, this balancing exercise fits within an ethics of political liberalism (Jensen, 2002, pp. 40–44). According to this ethics, public authorities should protect the rights and freedoms of individuals and of legal entities such as enterprises and organizations. The only reason for which persons may be restricted in their actions by the use of coercion is to prevent unacceptable harm to entities – in this case humans, animals, and plants – worthy of protection. The task of public authorities consists, within this liberal tradition, of creating a general legal and institutional frame within which economic actors are allowed to act and trade. Within this general liberal

[9] The same, though, holds for many other policy documents. See, for instance, the overview provided by Sandin (1999, pp. 902–905). Sandin himself does not link precaution to sustainable development either. According to Sandin, who made an analysis of several formulations of the Precautionary Principle, the central idea of the Principle is that it is ''mandatory to limit, regulate, or prevent potentially dangerous actions before scientific proof is established'' (Sandin, 1999, p. 890).

framework, restrictions on free trade can only be justified in order to prevent harm to third parties.

This interpretation does not consider precaution as related to a public ethic. A public ethic takes societal goals – for instance, Sustainable Development[10] – as its starting point and defines, consequently, the rights and freedoms of individuals and organizations in function of these societal goals. The general legal and institutional context is intended to define boundary conditions for the actions of economic actors that help, or at least do not hamper, the realization of societal goals.

A liberal interpretation of Precaution implies a harm-, rather than goal-, oriented approach. The Precautionary Principle is only applied when an assumption of a potential risk exists (COM, 2000, p. 7). ''The trigger for precautionary action is that the desired level of protection for the environment or health could be jeopardized'' (McNelis, 2000, p. 547). The main question is whether it is sufficiently plausible that the particular application will cause so much harm – independent from possible advantages – that a precautionary approach is needed. It is the degree of uncertainty of plausible and sufficient harm (sufficient evidence of sufficient harm) that triggers the idea of Precaution (O'Brien, 2003).

This harm-oriented approach contends with a serious problem. Detached from explicit goals, it is not clear what counts as ''unacceptable harm.'' The identification of potentially harmful effects involves unavoidably a number of value judgments. Judgments are, for instance, made about which kinds of harm to assess and which to ignore, about what baseline to use for assessing harm, and even about what counts as a harmful impact (Carr, 2002, pp. 34–35). Should one, for example, compare the impact of GM crops with the impact of conventional agricultural practices or with the impact of organic agriculture (as Austria proposes). Does one only count direct harm or also indirect harm (such as the impact of changes in herbicide use as the result of the introduction of herbicide-resistant crops). And does only harm to non-agricultural land count as environmental harm or also (economic) harm to agricultural land? As long as such lack of clarity remains concerning what counts as ''unacceptable harm,'' the EU will hardly be able to realize its objective to apply the Precautionary Principle in a consistent way.

[10] See, for instance, the Swedish *Environmental Policy for a Sustainable Sweden* (Sweden Ministry of Environment 1997/89). The Swedish government established fifteen environmental quality objectives to accomplish the overall environmental objective. These objectives were the outcome of extensive public discussion and debate (O'Brien, 2003, p. 286).

The Belgian Federal Council for Sustainable Development (FRDO) gives some short comments on the European liberal interpretation of Precaution (FRDO, 2000). The Council states at the outset that a legitimate application of the precautionary principle should be based on societal priorities – Sustainable Development, democratically defined levels for the protection of the environment and human health. This also implies that the domains of application of the principle exceed the domain of health and environment. The Council ''thinks it interesting to contemplate applying the principle also in other domains where both scientific uncertainty and a possibility of serious harm exist. This can be in situations relating to social security, justice, social coherence, and this both at national and global scale'' (FRDO, 2000, p. 5).

3.2.2. *Particular objectives or particular technologies as the starting point for precaution?* In the present European regulatory context, particular technological applications form the starting point for implementing a precautionary attitude. GMCs, for instance, are a type of technological applications for which a precautionary attitude is deemed fit. Biotech industries object to this preselection. They argue that new crop varieties should be evaluated according to their characteristics (as is the case in Canada), not according to the kind of technology with which they were created. They oppose, hence, the *a priori* precautionary approach taken with regard to GMCs (and, thus, the necessity of a separate authorization procedure), while new crop varieties with comparable characteristics that are, however, created with more conventional techniques are seemingly not to blame. In line with this course of reasoning, they stress the importance of the principle of familiarity in order to evaluate potential risks of GMCs. (In the European Deliberate Releases Directives, the principle of familiarity is mentioned as the second priority, next to the principle of precaution, to assess authorization requests.)

From a liberal interpretation of precaution, the restriction of an *a priori* precautionary approach to particular types of technological applications is, indeed, hard to justify. In case public authorities do not deem it necessary to assess more conventional agricultural techniques, one cannot easily provide counterarguments to the conviction of biotech industries that a separate assessment procedure of GMCs is discriminating. Things change, however, when one interprets precaution as an attitude in the service of predefined sustainability goals. In case one takes predefined goals, rather than particular technological applications, as the starting point and develops and selects technological applications in function of these goals, precaution should apply to the whole variety of technological applications that are selected (rather than to none of them,

as biotech industries – in line with their liberal interpretation of precaution – suggest).[11]

3.2.3. *An integral evaluation*. A precautionary attitude in the service of sustainable development implies an integral evaluation. This means (a) that not only environmental and health aspects of technological applications are evaluated, but also social, economic, and ethical ones, (b) that the technologies' risks or not assessed independent from their possible advantages, but that a weighing of risks and benefits takes place, and (c) that the risks and benefits of one technological application are compared to the risks and benefits of other suitable technological alternatives given particular sustainability goals.

At first sight the European Communication seems not to oppose this idea of an integral evaluation. Three considerations, described in the Communication, are important to mention here. First, regarding the criterion of proportionality – measures should bear a proper proportion to the intended protection level – the Communication suggests that possibilities to replace intended products or processes by less dangerous ones should be taken into consideration (cf. c). Second, regarding the criterion of weighing costs and benefits it states, to begin with, that a balancing of costs and benefits should not consider only economic data, though an economic cost-benefit analysis should be part of the investigation whenever such an analysis is feasible and desirable. And, what is more important, it states further that an analysis of the effectiveness of several possible options and of their acceptability for the public should be examined, since it is conceivable that society is prepared to pay a higher price in order to guarantee an interest deemed primordial (cf. b). Third, regarding the criterion of considering scientific developments, the Communication puts forward that one should look for better methods and instruments for risk-evaluation that include all relevant factors such as, for instance, social-economic information and technological perspectives (cf. a).

The problem is, however, that these considerations only get meaning in the phase of deciding on appropriate precautionary measures, i.e., after a previous risk assessment with regard to a particular technological application has taken place and the conclusion fell that sufficient evidence of

[11] This tension between a harm- and a goal-oriented interpretation of precaution is illustrated in the following example. While some proponents of GM crops and food argue against additional precautions on the grounds that such precautions are not imposed on conventional crops and food even though they have some adverse impacts, some European member states (e.g., Denmark and Sweden) take a different view. They believe that GM crops should only be approved if they are likely to reduce the environmental impact of conventional agriculture or, at least, do not preclude more sustainable forms of agricultural production being adopted in future (Carr, 2002, p. 36).

sufficient harm exists. According to a liberal interpretation of precaution, the conclusion that unacceptable risks exist is, indeed, a precondition for applying precautionary measures.

In such a harm-oriented approach, the search for alternative technological applications cannot begin before the plausibility of sufficient harm is established. This implies that alternative technologies are not considered when the harmfulness of a specific technological activity – either or not with the help of small restrictions or adjustments – remains below a certain level that is deemed acceptable (O'Brien, 2003). The preceding risk assessments to be made, according to Directive 2001/18, are limited to environmental impacts, "thereby missing the economic and social dimensions of sustainable development" (Karlsson, 2003, p. 22).[12]

A harm-oriented approach implies, moreover, that, in case consideration of possible alternatives does happen, it begins late and in an unsystematic way. One tends, first, to investigate only those alternatives that bear close resemblance to the initial technology (Karlsson, 2003, p. 20; O'Brien, 2003). Second, experts of advisory bodies are often not in a position to compare alternatives: they have to advise on products that are already on the market or that will be introduced very soon, or possible alternatives (and, hence, their potential risks and benefits) are hardly known. The fact that many R&D activities, taking place within private enterprises, are subject to secrecy clauses does not stimulate a scientific comparison of possible alternatives. Third, in some cases, European regulation even forbids a comparison of alternatives. It is, for instance, legally not allowed to prohibit a pesticide because it is less good than an existing alternative.[13]

3.3. *Precaution and its Procedural Form*

3.3.1. *A continuous learning process*. A goal-oriented approach presupposes (even more than a harm-oriented one) a continuous learning process, for scientists concerned as well as for citizens and policy people (O'Brien, 2003). Since the implementation of various alternatives involves many uncertainties, a continuous monitoring of effects is necessary. Some alternatives can be more and others less harmful than initially expected. Or it can turn out that one urgently needs to look for new alternatives. Co-operation from all sides of a society and transparent participatory political processes are needed to implement such learning processes.

[12] See also the strict attitude of the Belgian SBB, as discussed in Section 3.1: the SBB does not allow a discussion on economic impacts, nor on potential scientific or societal advantages of the intended releases.

[13] See for the Belgian situation, for instance, the reports 'Casus Hoge Gezondheidsraad' en 'Casus Bioveiligheidsraad' on www.ua.ac.be/SPIRE.

This idea of a continuous learning process is at odds with the guiding principles of non-discrimination and coherence, as suggested by the Commission. The Belgian FRDO joins in with these principles, because of the desirability of a harmonization on a European level. Its defense of these principles can, however, harm its own interpretation that the precautionary principle should respond to previously defined societal objectives. Changing societal concerns and changing scientific information can indeed ask for stricter precautionary measures than had been applied in the past in comparable situations. With Carr, we can, moreover, question what are "comparable situations" if they are not linked to predefined goals. "For example, proponents of GM crops and food believe they are no different from the equivalent conventional products, so consider that precautionary measures are unjustified. Critics argue that there are substantial differences that justify precaution" (Carr, 2002, p. 36).

3.3.2. *Integration of public concerns and vision.* In its Communication, the European Commission hardly considers the possible contribution of the wider public to risk evaluation and management. The Commission refers, at one passage, to the fact that the EU and its member states signed the Aarhus Convention in June 1988. According to the Commission, the importance of this Convention relates to its defense of transparency, accessibility of information, and involvement of all relevant parties with the investigation of the various possibilities for risk management "as soon as the results of the scientific evaluation and/or risk evaluation are available" (COM, 2000, p. 10).

The GMO Directive 2001/18 also opens the way for public participation, at least to the extent of consultation of the public and interest groups. In what precise way this consultation will be carried out is left to the member states themselves to decide. As Karlsson suggests, however, the present system for assessments of GMOs, "with its strong focus on scientific, so-called objective, risk assessments, worked out by experts within authorities that have limited contact with the surrounding society," is insufficient for at least three reasons (Karlsson, 2003, p. 21, compare with Carr, 2002, pp. 36–37). "First, such a system clearly neglects the value dimension of issues related to sustainable development, and gives less legitimacy to the perceptions of the public than to the so-called objective aspects. Second, since the actual subjectivity and values of the experts are not officially acknowledged, their evaluations might unintentionally be given too much weight in relation to the evaluations of other stakeholders. Third, the striving for assessments in exclusively scientific, often only quantifiable, terms easily and frequently results in a tendency among experts to overlook other aspects, such as the social dimension of the concept of sustainable development."

The Belgian FRDO takes public involvement with the implementation of a precautionary approach more serious than the European Commission

does.[14] According to the FRDO applying precaution implies transparency and democratic legitimacy in the three dimensions characterizing policy processes: the scientific knowledge regarding potential harm, the decision to apply the precautionary principle, the definition of possible precautionary measures (FRDO, 2000, p. 4).

With regard to the first dimension, the FRDO defends, first, transparency regarding procedures and substance of the scientific investigation (FRDO, 2000, p. 7). It asks, second, to inform on the simplifications, estimations, and choices to neglect some aspects. ''Even in case one can justify these simplifications or estimations from a scientific perspective, one should interpret them within a context of societal choices and priorities.'' The FRDO asks, third, that the scientific information mentions explicitly credible scientific minority advices (FRDO, 2000, p. 9). It asks, fourth, to provide room for contributions of social sciences, in order to offer decision makers insights into the risk perceptions of the wider public. It argues, fifth, for the organization of a public debate following the scientific debate. It defends, finally, to take also other than scientific expertise – ''the experience of people who are confronted with the problem presumed'' – into consideration.

The second dimension regards the political decision whether a potential risk is acceptable or not. According to the FRDO, the decision process should be based on the protection levels and the priorities laid down by society via democratic processes. In order to define these protection levels and priorities, investigation of the use of the product or process at stake and of possible alternatives in order to fulfil the same objectives with less chance of harm are needed. ''This investigation should fit in with the needs of society in the frame of sustainable development'' (FRDO, 2000, p. 9).

The FRDO does not argue explicitly for transparency and societal legitimacy where it discusses the third dimension, namely defining appropriate precautionary measures.

3.3.3. *Transparency concerning the economic context with its particular power relationships?* According to the European stakeholder dialogue on biotechnology, organized by IMSA Amsterdam together with Monsanto, the majority of stakeholders interviewed oppose the introduction of GM products in Europe, not because they oppose biotechnology per se, but because they resent the biotech industry's behavior.[15] They resent, for example, its failure to address basic fears and emotions concerning GM technology. Another point of critique is the lack of choice between GM and

[14] ''The Council is, however, of the opinion that the conditions that guarantee this transparency and involvement are circumscribed very vaguely in the text of the Commission. It is advisable to clarify them'' (FRDO, 2000, p. 8).

[15] www.imsa.nl consulted on July 13, 2004.

non-GM food. Environmental risk is stakeholders' main concern, especially the gene flow potential of the inserted gene construct. And generally no clear benefits from the technology are perceived for European agriculture. All this shows that the European public does not trust the biotech industry, because it has no say in the choices made to develop one particular biotechnological application rather than another and because they distrust the motives on which industry's actual choices are based.

The EU itself takes an ambiguous attitude towards biotechnology. Contradictions between regulation and promotion contribute to fostering public controversy (Todt, 2004, p. 144). Indeed, sustainable development is but one of the factors driving present European regulation, next to competitiveness (and governance) (Löfstedt, 2004, p. 237). Europe seems, in fact, to worry more about the maintenance or strengthening of its biotechnology sector than about sustainable development.[16] It experiences, moreover, international pressure – via the WTO and the USA – to pursue a more flexible GMO-policy.[17] In such circumstances it goes without saying that the

[16] "European Commission provides plan for the promotion of biotechnology. The EU cannot any longer afford insinuations regarding biotechnology as a whole. The public should become more aware of the advantages. This is in the report 'Life Sciences and Biotechnology: A strategy for Europe' that is accepted on Wednesday January 23 (2002) by the European Commission. The European Commission estimates that biotechnological applications will represent a market value of 200 billion Euro in 2010. The commission warns in her report that this turnover will mainly be made outside the EU. In the USA public concerns about biotechnology are less strong and it has a turnover that is three times higher and almost three times as much people have a job in this sector. The report contains 35 pages with measures that have to be taken by the European Commission, the European Parliament, national governments and industry. One suggestion is to start an information campaign to make people more conscious of the advantages for the environment, health and food security" (Newsletter nr. 03, week 4, 2002 of Consument en Biotechnologie, http://www.consubiotech.nl).

[17] "Transatlantic tensions rising over GM foods. EU trade commissioner Pascal Lamy has urged America not to take legal actions against Europe's moratorium on genetically modified (GM) product licensing amid rising signs that the USA could be about to launch a new trade war. The European Commission is reiterating its calls for member states to lift the moratorium. EU governments have refused to approve any new GM crops or similar biotech products since 1998. The USA believes the policy has no scientific foundation. But it has fought shy of launching a legal challenge through the World Trade Organisation (WTO), fearing this would antagonise EU countries while not achieving its aim of opening up the European market … According to a recent report in the Wall Street Journal newspaper, a proposal for legal action could emerge formally early next year. US trade minister Robert Zoellick is said to favour this course. The EU's Pascal Lamy responded to the rising tide of US frustration on Friday, urging America to think twice before launching a complaint…" (Environment Daily, issue 1351, December 16, 2002, http://www.environmentdaily.com).

EU is more willing to lend its ear to the lobbying work of biotechnology firms than to the skeptical voices (or even destructive actions) of its citizens.

4. SOME RECOMMENDATIONS FOR A PRECAUTIONARY POLICY IN THE SERVICE OF SUSTAINABLE DEVELOPMENT

In the following paragraphs, we consider how to adjust public policy in the field of genetically modified crops in order to make it more compatible with a precautionary attitude that is oriented towards the goal of Sustainable Development.

4.1. *Participatory Exercises*

We argued that precaution is an attitude that should stand in the service of a public and publicly defined ethic of sustainable development. A first task of public authorities consists, hence, in organizing participatory exercises in order to make people's sustainability goals and the arguments and values supporting them explicit. These participatory exercises cannot be done once and for all, since citizens' values and concerns change, not least because of their experience with changing technical and scientific possibilities. These participatory exercises should not aim at a straightforward consensus either. They should aim at a defensible and feasible degree of value-pluralism.

In actual policy processes, the power of the better argument (for which participatory exercises are meant) have to compete with the power of the market. In order to restrict the latter power, it is important to make economic (and, hence, political) power relationships explicit. This can be done by presenting a social map of the various actors concerned, including their financial position and economic interests that are related to deliberate releases of particular GMCs. Without these data public policy cannot really be called transparent. Without these data, the wider public lacks essential information to step in a public debate that gets down to the very core of the matter. Co-operation between public authorities and (economic) journalists in order to compose such social map seems appropriate here.

4.2. *Authorization Policy*

We explained that an integral evaluation – weighing of (possible) risks and benefits, comparing technological alternatives – that, moreover, integrates public concerns is a precondition for a goal-oriented precautionary attitude.

Publicly defined sustainability goals should, hence, form the general framework for authorization procedures regarding particular GMO-dossiers.

This framework can stimulate a more coherent scientific evaluation of possible harm. Without such framework, even scientists within natural-scientific advisory dissent about the concrete meaning of "harm," depending on their (disciplinary) paradigm and their personal norms and values. The same reasoning holds for the evaluation of "benefits." In order to be able to weigh possible risks and benefits, not only the meaning of "risk," but also of "benefit" should be connected to goals that are publicly made explicit. In order to weigh risks and benefits, not only natural-scientific, but also social-scientific information is needed, since harm and benefit can also have social, economic, or ethical dimensions. Although an authorization procedure unavoidably has a particular GMC as its starting point, it should, moreover, not exclude comparisons with technological alternatives that can help serve the same goals.

According to Mitcham and von Schomberg (2000), general public debate must be complemented with specific deliberative procedures, for instance deliberative technology assessment procedures, in order to respond to the specific challenges posed by particular technological applications. Consensus-conferences are one example of such assessment procedures that constitute an interface between science and politics.

4.3. *Research and Innovation Policy*

An authorization procedure can only be based on an integral evaluation on condition that research and innovation policy stimulates technological diversity against the background of publicly defined sustainability goals (and diversity in the practices to which the respective technologies belong). From the perspective of precaution, technological diversity is possibly as important as biodiversity.

Research and innovation policy should, further, anticipate a harmonization between the promotion and regulation of new biotechnological applications. It should not only stimulate scientific and technological research that can result in commercial products. It should also guarantee that sufficient uncertainty research is carried out in order to fill up essential knowledge gaps.

4.4. *Economic Policy: Redefinition of the Freedoms and Rights of Producers (and Consumers)*

Producers have a responsibility to make sure that their R&D activities are compatible with the goal of Sustainable Development. In order to realize such compatibility they need to know what citizens expect and what they are worrying about. This presupposes, indeed, that public authorities organize public debates where needed and provide private enterprises with clear

guidelines. R&D departments should, consequently, be made responsible for integrating these guidelines into the whole R&D process. They should also be made responsible for providing the wider public and relevant competent authorities with clear information concerning the environmental, social, economic, and ethical risks and benefits of their technological innovation.

5. CONCLUSIONS

We approve of the EU's intention to implement a transparent and coherent GMO policy. In this article we argue, however, that an interpretation that places the precautionary principle – in line with its liberal tradition – within the framework of risk analysis falls short in this respect, given present scientific and societal controversy. We defend an interpretation of precaution that is explicitly linked to the ideal of sustainable development. Precaution is then understood as an attitude, with particular substantial and procedural characteristics, that contributes to the realization of sustainable development. This goal-oriented interpretation of precaution serves the purpose of coherence and transparency better, though its coherence consists more of an adequate response to the ongoing evolution of societal valuations and technological potentials than of an adherence to past decisions.

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