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Policy understanding of science, public trust and the BSE–CJD crisis

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Abstract

The article investigates how institutional factors can produce risk using the Bovine Spongiform Encephalopathy (BSE)–Creutzfeldt–Jakob Disease (CJD) crisis in Britain as a case example. The paper focuses on the way policymakers understand science, and the role of precaution in issues of high uncertainty. It is argued that the failure to fully appreciate the complexity of the BSE–CJD situation resided in institutional arrangements that predisposed decision makers to adopt a counter productive approach in handling situations of high scientific uncertainty on the policy level. The article will demonstrate how these factors played out in the BSE–CJD crisis. © 2000 Elsevier Science B.V. All rights reserved.

Keywords: BSE–CJD crisis; Public trust; Scientific uncertainty; Policy complexity; Precautionary principle

1. Introduction

The first case of Bovine Spongiform Encephalopathy (BSE)[1] was reported in 1986 and the government made it a notifiable disease 2 years later in 1988. At this point, the authorities identified BSE as a relative of scrapie — a familiar brain disease in sheep. It was thought that cattle had contracted this disease as a result of a change in their feed, which led to diseased sheep and cattle remains being used in cattle feed. Since scrapie had been known to be harmless to humans it was reasoned that a similar situation would be true for BSE. In response to the lack of information on BSE, the government set up an Advisory Committee (The Southwood Working Party) of distinguished scientists to

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[1] Bovine Spongiform Encephalopathy (BSE) also known as "Mad Cow Disease" is a chronic degenerative disease affecting the central nervous system of cattle. It belongs to a family of diseases called Transmissible Spongiform Encephalopathies (TSEs) which are characterised by their unique brain pathology. Examples of TSEs found in other species include scrapie in sheep or Creutzfeldt-Jakob Disease (CJD) and kuru in humans.

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Table 1
Chronology of the BSE crisis from November 1986–August 1996

November 1986 BSE first identified by Central Veterinary Laboratory.
5 June 1987 Chief Veterinary Officer (CV) informs Minister of Agriculture of the new disease.
15 December 1987 Initial epidemiological studies completed, which concluded that ruminant derived meat and bone meal (MBM) was the only viable hypothesis for the cause of BSE.
3 March 1988 Department of Health informed. Expert Advisory Committee recommended.
21 April 1988 Southwood Working Party established. As a result, Government indicated it would legislate to make BSE notifiable and to ban ruminant derived MBM.
21 June 1988 BSE became a notifiable disease.
July 1988 On the recommendation of the Southwood Committee, decision announced to introduce slaughter of affected cattle and ban on ruminant derived MBM comes into force.
8 August 1988 Compensation Order introduced. Compensation set at 50% of value for confirmed cases, 100% for negative both subject to a ceiling.
February 1989 Southwood Report received and published, with Government's response. Establishment of Tyrell Committee on research announced (as recommended by Southwood).
10 June 1989 Tyrell Report received by Government.
13 June 1989 Decision to introduce offals ban announced at the initiative of the Government.
28 July 1989 EC ban on export of cattle born before 18 July 1988 and offspring of affected or suspect arrivals.
13 November 1989 Ban on specified bovine offals (SBO) came into force.
9 January 1990 Publication of Tyrell Report on research and Government response.
14 February 1990 Compensation figures changed (see 8 August 1988). Full compensation would be paid up to a ceiling.
1 March 1990 EC restricts export of cattle to animals under six months.
1 April 1990 Disease made notifiable to the European Commission.
3 April 1990 SEAC published under chairmanship of Dr. David Tyrell.
9 April 1990 EC decision to ban export of SBO and other tissues.
11 April 1990 Humberside CC withdraws British beef from school meals.
24 July 1990 Dr. Tyrell writes publicly to the CMO to say 'any risk as a result of eating beef or beef products is minute'. Thus, we believe there is no scientific reason for not eating British beef and that it can be eaten by everyone.
25 September 1990 Ban on the use of SBO extended to its inclusion in any animal feed. Export of such feed to other EU member states also banned (Export outside the EU banned 10 July 1991).
15 October 1990 Farmers required to maintain breeding and movement records.
27 June 1994 Prohibition on the feeding of mammalian protein to ruminants throughout the EU, other than Denmark.
1 April 1995 Compulsory blue staining of SBO.
15 August 1995 The Specified Bovine Offal Order 1995 consolidated and tightened the existing rules for processing SBO.
Autumn 1995 Spot checks disclose widespread failures to comply with regulations in handling of SBO abattoirs (48%) and knackeries and hunt kennels (65%).
28 November 1995 Acting on advice from SEAC, Government announced its decision to stop the use of bovine vertebral column in the manufacture of mechanically recovered meat.
20 March 1996 Government announces 10 cases of new style CJD, and their possible links with BSE. Further control measures introduced. Cattle over 30 months must be deboned and trimmings kept out of the food chain.
27 March 1996 EU ban on all UK beef exports, whether to member states or to other countries.
28 March 1996 Government announces calf-slaughter scheme and financial aid for the rendering industry.
3 April 1996 Introduction of 30-month slaughter scheme to ensure that all cattle over 30 months at the time of slaughter do not enter the human or animal food chains.

Table 1 (*continued*)

21–22 June 1996 Florence Summit of the European Council agrees framework of actions required by the UK prior to any lifting of the export ban.
29 August 1996 Professor Anderson of Oxford and his team in collaboration with Wilesmith and others at the Central Veterinary Laboratory publish their analysis of the BSE epidemic in Nature vol. 382, predicting that the epidemic will virtually die out around 2001 irrespective of further measures.

study the problem. This committee recommended a ban on the use of certain types of offal (brains, spinal cords, etc.) as cattle feed and suggested a plan for recalling diseased cattle. Although the committee agreed that the hypothesis that BSE was harmless to humans was probably correct, it also warned that the consequences would be very serious, if this hypothesis proved to be incorrect.

In March 1996, the Government announced that there might be a link between BSE and 10 recently reported cases of Creutzfeldt–Jakob Disease (CJD) at that time. This statement was made on the basis of advice contained in a report by the government-appointed Spongiform Encephalopathy Advisory Committee (SEAC). The SEAC concluded that in the absence of any other explanation the 10 reported cases of CJD were most probably linked to BSE exposure. The Committee supported the Ministry of Agriculture, Fishing and Food's (MAFF) position that eating beef and drinking milk from British cows is safe (see Table 1 for a chronology of events[2]) once certain additional regulatory mechanisms had been implemented.

These two apparent contradictory statements by the government triggered near public hysteria. Beef sales in Britain, and on the European continent, took a sharp dive downward and initiated what might possibly be one of the most costly public policy crises of the decade. This high cost is not limited to the financial costs incurred, which, according to one estimate, is somewhere in the region of $10 billion worldwide [1] but also immense loss in public trust of the political apparatus, the costs of which are difficult to estimate.

The unusually strong public response (in comparison to previous reports about food contamination) to the knowledge that beef may be unsafe was not however merely a response to the government announcement. Public trust in the authorities' ability and commitment to keep its food supply from being contaminated was probably at its lowest when the BSE announcement was made. This had to do with the fact that the decade leading up to the BSE–CJD crisis was one that featured a number of different kinds of food scares in Britain — including salmonella in eggs, listeria in cheese, *Escherichia coli*, antibiotics and hormones in meat, and pesticide residues and phthalates (benzene-related compounds) in just about everything. In connection with the BSE issue in particular, the public had been aware of the threat to cows arising from BSE since at least 1988 [2], when it was made a notifiable disease. At this point however, there was no acknowledged threat to human life. In fact, one may argue that public authorities

[2] See also the website at http://www.bse.org.uk for a complete and updated chronology of events that dates from 1732 to the present.

were insistent on the absence of such a threat. According to some social science studies of risk such as that of Powell et al. [3], it is the public authorities' insistence on the safety of beef for a decade before 1996 announcement that did the most damage to public trust.

Despite the general acknowledgement that the BSE crisis is a public policy crisis, surprisingly little attention has been given to the problem by policy science researchers. The bulk of writing on the issue to date has been done either by journalists [4] or media analysts [5]. This may have something to do with the fact that scientific analysis of public policy is still an activity best performed retroactively and the BSE crisis is only now approaching a stable status.

Another way to read this is that the weak policy science voice on the situation to date echoes the treatment given to the problem by policymakers. When the BSE threat first came to light, the policymaking community appears to have defined the role of the scientific contribution as one that would be confined to answering questions such as: 'Can BSE in cows pose a threat to human health?', 'If so, what would be the nature of that threat?', and 'what can we do about it?'

Even after a threat to human health had been posited through the BSE–CJD linkage identified by SEAC and a crisis was clearly underway, the policy approach with respect to the type of scientific advice necessary did not really change. Put differently, to the extent that the BSE–CJD crisis was conceptualised in the policy arena as one that was precipitated by a lack of precise scientific information about BSE, the public policy contribution to the crisis was not identified as a matter worthy of seeking scientific attention.

The present article takes its point of departure from this gap in the current discussion and focuses on the BSE problem as an institutionally predicated crisis of risk management. More specifically, our interest is in identifying institutional practices that served as sources of risk in the public policy nexus relevant to BSE–CJD.

The text is divided into three sections, the first of which outlines the institutional policy arrangements from which the present treatment takes its point of departure. The second and third sections list and discuss some of the institutional factors that we contend were instrumental in shaping a crisis outcome. These are lack of public trust and the way policymakers understand science (policy understanding of science). The article concludes with a discussion of how an emphasis on sound policy design and implementation could have assisted in a more successful application of the precautionary principle in the BSE–CJD crisis. The emphasis in this discussion is on different ways of implementing precaution in order to induce the most desirable policy outcomes.

2. The institutional framework

We would like to advance the claim that the BSE–CJD crisis was a product of mutually reinforcing institutional factors, which acted to determine how the BSE threat was perceived and defined by policymakers and the range of possible solutions that they believed to be workable. This claim is at first sight a modest one, however, it does differ from the official narrative on the BSE–CJD crisis, which frames it as a problem of the absence of the scientific information needed for decision-making (scientific uncertainty).

While we agree that scientific uncertainty played a role in the BSE–CJD crisis, our view is that it is only one of many variables that shaped the crisis. We further contend that the importance of scientific certainty in this as in other similar contexts is conditioned by institutional negotiations. A similar thesis has been advanced by Kasperson and Kasperson [6], who maintain that society's current management system keeps generating surprises because of a management attitude that takes the position that risks of a certain levels of probability cannot happen. This attitude in turn prevents us from conducting effective risk prevention. In relation to the BSE–CJD crisis, De Marchi and Ravetz [7] came to a conclusion similar to that of Kasperson and Kasperson and the one made in this paper.

Our approach takes its point of departure from an understanding of policymaking as a cognitive activity conducted within a stable framework of institutional practices, routines and cultural mores [8]. The latter, we argue, may be understood as a frame that shapes how problems are defined, the kinds of knowledge inputs that are deemed necessary and finally the solutions are preferred and chosen. We further posit that the degree of scientific certainty required of the informational inputs to any given decision is in part determined by the cognitive frame of policy at any given moment in the process. The BSE–CJD crisis may prove a good empirical case for exploring this view of policymaking.

For the present purposes we shall posit that there are at least two major institutional factors that determine the policy landscape at any time, i.e. factors relating to how policy is conceptualised on a broad level and factors relating to the general issues around policy implementation. In the case at hand, the factors related to policy conceptualisation would include political culture, level of public trust in government, European Union politics and regulations, policy understanding of science and national interests. The last may be further elaborated as the threat that BSE posed to Britain's export position vis a vis other European member states. A second factor in this regard is Britain's longstanding position as a reputable supplier in the international cattle industry.

The policy implementation-related factors may be said to include institutional aspects that are directly related to the risk management and communication side of the problem. Some of these are the structure of the MAFF and the political ideology of the ruling party (e.g. its commitment to deregulation). Thus, the conception of what is institutionally relevant to the case at hand includes not just bureaucratic structures but also routines, socio-cultural imperatives, etc., of the risk handling institutions, which in turn are found on many levels of social and political organisation. In the case of BSE–CJD, institutional factors can thus be said to reside within a complex web of interrelated policymaking activities, where government is but only one relevant factor. With this in mind, Section 3 focuses on a key issue in the government's response to the crisis, i.e. the way in which policymakers' understanding of the role of science in policymaking and their expectations of science contributed to the crisis.

3. Policymakers' understanding of science

One of the more curious aspects of the government's side of the story in the BSE crisis has been its insistence that it has, since the BSE threat first emerged in 1986,

followed a policy of 'letting science be its guide' [9]. At first sight this may appear — as one Minister of Parliament described it — laudable[3].

However, when subjected to further scrutiny, one finds that a number of peculiarities of this approach made it liable to produce crisis. These may be attributed to what we term here the policy understanding of science in Britain. In the following paragraphs, we shall map the defining features of policymakers understanding of science and its role in decision-making and show how they contributed to the crisis at hand.

The best available evidence from studies of environmental and risk-based controversies in which human health is potentially challenged suggests that in any given situation, scientific opinion often diverges. This is particularly true of new risks such as that of climate change, genetically engineered foods or AIDS. The BSE case falls within this category. When BSE first emerged there was no scientific information or scientific consensus on its potential as a public health threat. The policy strategy of 'let science be the guide' was therefore initiated with the understanding that scientific research into this connection was only just being initiated. If one extrapolates from the way in which science has worked in similar situations such as the climate change issue, one would have to assume that policy decisions would have to be made in anticipation of scientific evidence rather than as a result of them. This is not an unusual situation for policymakers, in fact evidence from other instances where scientific uncertainty was an issue in policymaking show that there are at least two general directives. These are: (i) seek scientific advice, and (ii) do nothing until a reasonable degree of scientific consensus emerges. These directives are at first sight simple and unambiguous. When subjected to closer scrutiny, one begins to see that this simplicity vanishes the moment one has to translate the directives into practice. At this point, it becomes clear that for such principles to work, policymakers would need to have a kind of cognitive frame of reference as well as a set of institutional practices that would help them to operationalise these directives. Consider for instance the first principle 'seek scientific advice.' This would raise the following questions.

- What kind of scientific advice should be sought?
- How much money should be spent on getting this advice?

Once these questions are answered, the second directive of 'do nothing until a reasonable degree of scientific consensus emerges' raises another set of questions. These include the following.

- What level of scientific certainty constitutes a reasonable consensus in this case?
- What degree of precaution is warranted in the given instance?
- What level of scientific certainty would be required to justify the costs of particular precautionary policy options?

[3] Statement made by MP David Heathcoat–Amery to the House of Commons, 17th February, 1997 taken from: House of Commons Agriculture and Health Committees' Joint Report: BSE and CJD: Recent Developments, 1996, also cited in Maxwell, R. (1997), p. 17 [9].

All of these questions require judgement calls for which policymakers look to their cognitive frame as well as intuition for the answers. More importantly, it is only the influence of scientific information in the eventual decision that will be determined by the kinds of institutional practices, etc., which policymakers bring to bear in answering the questions outlined above.

The role of science in the BSE affair confirms the analyses of, among others Garvin and Eyles [10], who maintain that in situations of high uncertainty, science and policy enter into a symbiotic relation in which the distinction between the two entities become blurred. A closer examination of the way in which the 'let science be the guide' policy was implemented in the BSE case provides the policy studies community with yet another dimension of how this blurring unfolds. It may be argued that the information to be gleaned from this case is unique to the British policy setting. However, to the extent that such information illustrates the specific types of problems generated by situations of high uncertainty, it can also be said to have implications at a more general level.

3.1. Blurring the boundaries

The diversity of scientific opinion on BSE meant that any application of a 'let science be the guide' policy would demand a choice among scientific knowledge claims if not claimsmakers on the part of the policymakers. This policy choice played a decisive role in the crisis in three ways. The first was the creation of an in-group and an out-group of claimsmakers among the scientific community. Put differently, certain groups of scientists were declared to be politically sound and by inference so were their scientific claims while others, such as Narang, Dealler and Lacey, were unsound and so was their science.

The in-group/out-group distinction seems to have been predicated on the degree of precaution advocated. Thus, out-group scientists tended to be advocates of very strong precaution and full communication to the public. In-group scientists such as Sir Southwood (not himself a BSE expert) tended to take the view that once certain precautionary measures were in place, "there was no value in stressing that some people might already have caught a really terrible disease about which nothing could be done" [11].

Second, this political division of the scientific community taken together with MAFF's monopoly on carcasses of BSE-infected animals acted as a constraint on the internal workings of science. The reason is that out-group scientists had little or no access to research material.

The in-group/out-group distinction of scientific claimsmakers was reinforced by attempts to undermine the credibility of out-group scientists. In this respect, the history of the BSE case resembles that of the early history of the discovery of the connection between chlorofluorocarbons (CFCs) and the depletion ozone layer made by Rowland and Molina. In the early phases of Rowland and Molina's work, they were often heckled at public meetings when they attempted to present their claims [12]. The structure of these two cases have a further similarity in that in both instances, the economic interest of a particular group in society was allowed to impede the investigation and communication of knowledge about challenges to public health. The BSE–CJD case stands out,

however, because one expects private corporations to pursue profit without regard to public interest. The state, however, is still perceived as an institution whose main functions include the balancing of competing social and economic interests for the good of the citizenry as a whole.

Thus, the 'let science be the guide' policy appears to have been operationalised as 'let the science that supports the policy status quo be the guide.' This points to the importance of the overall cognitive framework of a given policymaking structure in determining how it utilises information. In Section 3.2, we will outline a second defining feature of the policy understanding of science that emerged in the BSE–CJD crisis, i.e. the hard science bias.

3.2. The hard science bias

In the Germanic tradition, the term science is often used to refer to all types of scientific inquiry (natural, human and social sciences). The Anglo-Saxon tradition as practiced in the USA and England reserves the term science for those disciplines, which fall within the ambit of natural sciences with a few possible exceptions such as economics. This difference in nomenclature is to a large extent based on a perception in the Anglo-Saxon tradition that science is a term that should be reserved for those disciplines that could deliver what are perceived to be hard data. Put differently, the knowledge provided by science in this sense of the term carries a high or at least a quantifiable degree of certainty. The social and human sciences are perceived to deliver soft data, the reliability of which is either difficult to estimate or is subject to change.

It is our contention that this perception of what type of knowledge is scientific also played a role in determining what type of scientific advice policymakers could imagine would be useful in either avoiding or managing the BSE threat. Thus, scientific input from behavioural science as to what were the likely reactions of the public, should a worse case scenario emerge, was never sought. The following, taken from a House of Commons debate, is revealing.

> **Professor Lang** '.... Even if MAFF and Mr. Hogg, repeating what Mr. Gummer and Mr. Dorrell said back in 1989 when he was Junior Minister of Health, say that beef is 100 per cent safe, I do not think that the public now believes that view. This is why I quoted earlier an opinion poll of only two weeks ago. You are essentially having promises of certainty put into a situation of uncertainty as far as the consumer is concerned. The issue now is the psychology of risk. There is a burgeoning literature by academics that I would recommend the Committee spend some time looking at.'
>
> **Mr. Spring** 'I think Members of Parliament know about the psychology of risk.'
>
> **Professor Lang** 'I am not certain that is true, with respect.' [13]

The communication between science and politics encapsulated in the above citation does demonstrate an entrenched view of what type of science Members of Parliament perceive themselves as having need to seek the advice of scientists. Thus, the psychology of risk, for instance, is referred to as something that Members of Parliament know about. Implicit in this is policy division of science into that, which experts are needed to

provide and that which policymakers can do themselves, is a boundary management between politics and social science. The need for this boundary management derives from the nature of the social science knowledge in question; decision-makers may feel that seeking social scientific advice on how to act on scientific knowledge about a particular issue may be the same as letting science decide policy. Science's role in this understanding of the division of science and politics is one of providing information about causes and effects. Politics is the art of deciding how to act on this information. Information taken from Sir Richard Southwood's testimony to the ongoing BSE inquiry, also reflects this division of labour in that Sir Southwood's task as chairman of the SEAC was defined as:

> "To carry out a thorough assessment of the scientific data available .... However, he should not put Ministers in a box as to the policy line they should take in deciding how to implement scientific advice."[4]

The way in which policymakers operationalised the 'let science be the guide' policy provides some insight into how the boundaries of science and policy become blurred during situations of high uncertainty. While this may be regarded as a general insight gained from this case, it is also important to emphasise that this does not imply that this blurring is inherently pathological, i.e. that it undermines the individual credibility of science and policy.

The BSE–CJD affair demonstrates that notions such as the 'policy understanding of science' are fairly stable constructions and form part of an institutional practice that is consistent. The reason for this is that they are logical products of more deep-seated values and perceptions of reality. In the British case, the hard-soft science popular ideology is one of these more deep-seated notions. Another is the view that the trustworthiness of a particular individual derives from his/her standing in the community rather than on rational–legal criteria such as knowledge of the subject at hand. Jasanoff [14] provides a good illustration of this when she contrasts the way in which US and British decision-makers choose their scientific advisory committees. The former emphasise knowledge of the issue at hand while the latter tend towards choosing notable individuals whose record of service to the public has been demonstrated in the past. The latter approach while having its merits does have the disadvantage of making it difficult for a policy community to access all available information about a particular problem. Moreover, there is a tendency for policymakers to choose their scientific committees in a manner that stacks the die heavily in favour of their preferred conclusions.

4. Public trust and BSE

The issue of public trust has been a prominent one in the BSE–CJD debate. It has been argued by a number of commentators, that the British public's trust in its government suffered a tremendous setback as a result of the BSE–CJD crisis [15].

[4] Statement taken from Sir Richard Southwood's testimony to the BSE inquiry, March 9, 1998. The testimony to the inquiry is available at http://www.bse.org.uk.

As mentioned earlier, in trying to understand public response to the BSE–CJD crisis, one should bear in mind the prehistory in which the British government had failed to communicate honestly to the public about other challenges to the food supply. It is our contention that this prehistory not only disposed the public to respond with extreme skepticism to reports from the government about the safety of British beef, but it would have also predisposed the government to impose a veil of secrecy around the BSE problem.

The public announcement in March 1996 came after 10 years of government deliberations and secrecy on the BSE problem. The time lag and the failure of the British government to alert the European Union of its intention to make its infamous March 1996 public announcement also contributed to a public trust problem for the European Union as a whole. The government's insistence that beef was safe, the clear and very public disagreements among scientists on the issue taken together with a government history of misreporting on food risks contributed to what Jasanoff describes as *civil dislocation*. This is a 'mismatch between what governmental institutions were supposed to do for the public and what they did in reality' [16]. At this point citizens turn to other institutions for reassurance and action.

In the BSE case, this phenomenon was observed in so far as food outlets such as McDonald's® and Burger King® ignored MAFF reports about the safety of British beef and turned to routines of risk management that have been well tried in the business world. Their strategy was to reassure the public that they took its fears seriously — a strategy that scientists in risk communication have constantly exhorted public officials to adopt in situations of this type. Supermarkets issued detailed information about the provenance of the beef on the shelves and we were struck on a visit to England in 1997 by the number of restaurants that posted notices that the beef served was meat from cows no older than 30 months. In a similar view, one supermarket chain in Ireland even invested in diagnostic technology to test meat for BSE [17]. The extent to which the business community appropriated the task of risk management and communication in this crisis is a measure of the degree of *civil dislocation* at hand.

Could early risk communication have prevented the crisis? The answer to this question is of necessity complex. Analysts such as Powell et al. [18] argue that not going to the public at an early stage was a critical error. The government as well as its 'independent experts' such as Sir Southwood mentioned earlier took the view that communication was unnecessary once precaution was introduced. Before one begins to analyse the reasons for choosing the route of non communication, one must also bear in mind that in the first decade of the history of the BSE problem, not only Britain but other European Union member states as evidenced by the EU inquiry into the BSE crisis also failed to communicate that public health may have been endangered. 'Why was this policy response so unanimously favoured?' The similarity in the response suggests that there is a standard operating procedure in the way governments respond to uncertainty. In the case of the EU member states, this standard operating procedure would have been reinforced by the perception that communication to the European public would have most certainly led to a reduction in beef sales. This would in turn have meant an increase in demands for compensation from the Common Agriculture Policy that would have crippled the Fund. If one couples this with other context forming factors such as

the strength of the agricultural lobby within Europe, then there seems to have been pretty strong incentives within the policy system for not communicating to the public.

The events of the second decade of the BSE narrative show that the incentive for not communicating was also quite strong. The fact that Britain seems to have been worst hit meant that it could no longer, as it did in the first decade, see BSE–CJD as a European crisis. At the moment, it became a British crisis the other member states' positions as potential competitors for the beef market became an important consideration in the policy context. This is evidenced by Britain's complaints that other European states may have been under reporting, as well as the attempt to frame the problem as one of the EU vs. British beef. This problem has persisted to the present time after the ban on British beef has been officially removed at the EU level and manifested itself in first the German refusal to accept the lifting of the ban and at the time of writing (November 1999) the French are still resisting the efforts to give British beef a clean bill of health in the entire European union.

If one looks at the crisis both from the regional or the national perspective, one fact persists and that is that policymakers risked the public health in order to protect a small sector of the community's financial interests. Why was this approach rational from the perspective of those who adopted it?

It is at this point that it may be helpful to refer to the role of how particular policy routines for dealing with high uncertainty situations. The 'do nothing until a scientific consensus emerges' is as mentioned above a well-established rule of thumb for dealing with situations like BSE. However, this approach has an inherent problem in that it will always lead to crisis in situations where science cannot produce the necessary level of certainty for decisive preventive action. There is a well-established policy principle for dealing with such situations, i.e. the precautionary principle. In Section 5, we will focus on three scenarios for the implementation of precaution and show they can be applied in high uncertainty, low public trust situations such as the BSE–CJD case.

5. Implementing precaution under high uncertainty and low public trust

The precautionary principle (Vörsorgeprinzip) originated in Germany during the 1930s where it was first elaborated as part of a socio-legal tradition with a strong emphasis on social democracy. In its initial conception, the precautionary principle was regarded as part of a concept of good household management executed by a partnership among the state, the individual and the economy [19]. Although, the contemporary debate about precaution is for the most part focused on environmental issues, the application of precaution as a more general technique of risk management has a longer history in policymaking.

The attractiveness of the precautionary principle is that it has strong common-sense appeal and the public is generally in favour of it as a policy guideline for cases of high uncertainty. Despite its intuitive appeal, the implementation of precaution in policy is a very complex if not downright difficult exercise [20]. This may in part explain why the principle is not very popular among experts in the risk field. In this final section, we would like to address the policy problems elaborated above from a recognition of the

difficulties in implementing precaution with respect to costs and other considerations. For this reason we would like to propose three general scenarios for implementing precaution. This will be followed by a discussion of these scenarios in the context of the BSE case.

5.1. Three scenarios for implementing precaution

5.1.1. Very strong precaution

The scientific evidence is uncertain but the public is informed and public policy is changed on the premise that the evidence will prove the worst case to be the strongest likely outcome. Sweden's position on electromagnetic fields is a good example of a government policy based on very strong precaution[5] [21].

5.1.2. Strong precaution

The scientific evidence is too weak to justify radical changes in public policy given costs and other considerations. Public policy takes a 'wait and see' attitude based on halting further intervention until more evidence is available and communicating the possibility of there being a risk to the public. It is important to note here that even a 'wait and see' attitude incurs costs since halting further intervention is often costly. The BSE case is a paradigmatic instance of this and demonstrates that in considering whether to apply strong as opposed to very strong precaution, it is equally important to consider total costs as well as costs of strong precaution vis a vis that of very strong precaution.

5.1.3. Weak precaution

The scientific evidence is too weak to justify changes in public policy given costs and other considerations. Public policy should not be changed in any fashion but the public should be informed of possible risk.

It might surprise many observers of the BSE crisis to note that an examination of the government's policy decisions on the BSE crisis reveals a tendency towards strong precaution. This general record is further evidenced by Southwood, the head of the SEAC testimony to the UK BSE inquiry. According to Sir Southwood, the members of the SEAC

> "felt we should proceed as if transfer to man was possible and then apply what in Radiological Protection (Health & Safety) terms is known as the ALARA principle (risk should be As Low As Reasonably Achievable). I do not recollect that we explicitly used this term, though I was familiar with the concept through my role at the NRPB".[6]

[5] Among four Scandinavian cancer/EMF studies, three showed little evidence of a relationship between estimated residential power line magnetic field levels and rise of childhood leukemia, whereas, a 1992 study in Sweden found that children living in homes with magnetic field levels at the time of diagnosis retrospectively estimated at 0.1 to 0.29 μT had a leukemia risk 1.5 times higher than those in homes with lower levels; above 0.3 μT the risk was 3.8 times higher. But these risk estimates were based on just four and seven cases, and no cancer association was found with in-home magnetic field measurements generally made years after diagnosis.

[6] Professor Sir Thomas Richard Southwood DL, Statement to: The BSE Inquiry, § 27, available at http://www.bse.org.uk/frwit.htm.

The feed ban, compulsory notification of BSE and compensation were all policy measures that would have constituted a policy package based on strong precaution. What went wrong? Why was strong precaution inadequate? It is beyond the scope of this article to provide a thorough response to these two questions but a brief answer might suffice in providing insight into the problem at hand.

The policy failure in the BSE case is a good example of how good policy principles may be thwarted by bad policy design and implementation. In the case of the feed ban and the notification, British attempts to apply precaution were undermined by poor policy design and implementation. The initial decision to provide only 50% compensation for animals suspected of having BSE gave farmers an incentive not to report. It also further endangered public health by encouraging farmers to send their animals to market early before signs of illness could appear. This was clearly a case of bad policy design probably as a result of policymakers trying to apply strong precaution 'on the cheap.' For example, the decision to compensate for only 50% of the costs could be seen as applying precaution without having to pay the full economic costs.

The second policy failure in the application of strong precaution had to do with the implementation of the feed ban. It was decided in December 1987 that meat and bone meal (MBM) was the likely source of BSE, however, it took a further 7 months before the feed ban was implemented. Further, the issue of unused stocks of feed was not addressed, so MAFF could not know if farmers were still feeding their cattle MBM after the ban finally got under way, neither had MAFF communicated to farmers that the feed should not be given to other livestock such as pigs or chickens. If one peruses the chronology of the BSE crisis in Table 1, one finds that there were several similar implementation failures in the policy chain used to manage BSE.

The above points to the importance of not only broad policy guidelines that decision-makers can employ as heuristics in different situations but also the necessity of ensuring that the institutional structure for design and implementation of policy is adequate to the task at hand.

6. Conclusion

The above examination of the BSE–CJD crisis has provided us with a number of insights into how the policy process operates in instances of high uncertainty. Some of these are specific to the case at hand while others are clearly of a more general nature. With respect to the former, one can say with hindsight that policymakers' insistence on making the availability of 'precise scientific information' on the relation between BSE and CJD, the most important decision criteria for what should be done made their own decision-making process more challenging than it might have been. This emphasis had the unintended effect of de-emphasising the critical roles of good policy design, implementation, continuous monitoring and follow up procedures in any given policy situation.

A second insight is that while risk communication is often seen as a way of building public trust, the decision to communicate is itself dependent on the cognitive framework of policymaking. In the BSE–CJD crisis, an additional factor was the belief policymak-

ers know what is best for the public. This view both limits and empowers policymakers. On one hand, policymakers are empowered in the sense that they are keenly aware that it is their task to make the necessary decisions. On the other hand, this responsibility limits policymakers in cases where the information necessary for making the decision in question is just not available since they may fear that communicating this to the public will reduce their authority.

A similar paradox obtains with respect to communicating the risk to human life in the BSE–CJD case. There was no clear indication that there was a risk and the scientific studies necessary to determine this had barely begun at the time when it was necessary to make a decision. This uncertainty coupled with the fact that public trust was already low may have predisposed policymakers not to inform the public that there might be a risk. However, once it became obvious that there was some risk to human health, the previous failure to communicate acted in itself to further lower public trust.

Scientific uncertainty is itself a variable that is shaped and interpreted according to the overall cognitive framework that guides the policy process. The expert and the policymaker are involved in a complex web of interaction in which the former is assigned a great responsibility but in reality, expert information is really nothing more than one variable among many.

The issue of time is also an important, although not fully explored, factor in the problem of how to communicate risks. Problems such as BSE–CJD, climate change and the more recent issue of genetic manipulated organisms all belong to a category of risks that are unknown and may or may not occur in the future. The fact that even when precaution is applied in dealing with such risks, one has to justify it in terms of existing information about the threat as well as balance this against the real costs of precaution makes it difficult to say that mere precaution is an effective policy tool. It may not be a bad time to begin to reconsider some of the tools, which we use to make and justify policy in these instances. It might be that in such instances, the accounting systems that we use for most other policy decisions limit policymakers' ability to develop and implement sound policies of precaution.

Finally, our argument has been that the influence of individual factors such as scientific uncertainty, the decision to communicate to the public, the preference for certain types of science as opposed to others are all in turn conditioned by institutional circumstances. That being said, however, the BSE–CJD crisis is really an unremarkable policy crisis in that an examination of the factors that precipitated the crisis merely confirms the importance of long-standing axioms of what is good policy practice.

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