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## Managing risks or stifling innovation? Risk, hazard and uncertainty

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### ABSTRACT

In the UK 1 million people suffer food poisoning, with 20,000 ending up in hospital, at a total cost to the UK of £1.5bn a year. We are not currently putting appropriate time and resources towards addressing the most significant food risks. Science is not absolute. It never 'proves' safety, nor uniquely dictates particular decisions. Rather, it provides crucial indications of risks and uncertainties.

Risk assessment does not address difficulties assigning probabilities under states of uncertainty, for example with BSE or with endocrine disrupters. Risk managers need to take account of a wide range of factors when deciding on appropriate courses of action including political, social as well as ethical. The precautionary principle says; 'be careful' when we're unable to determine clear risk assessments under various kinds of incertitude. A risk-based approach can obscure how ethical issues fit into decision making, (like animal welfare, social implications environmental impacts, consumer choice).

Much risk controversy is really about the politics of technology. Currently we do not have effective spaces for discussing or deciding "which way to go?" The public are typically sophisticated at weighing up risks and benefits with uncertainty and don't expect 'zero risk'. What is needed is a democratic space for deliberating the implications of plural interests and values.

**KEYWORDS:** Food; uncertainty; incertitude; precautionary principle; risk management

### 1. Introduction

Managing food safety risks is a top priority for any food business. Damaging headlines, whether over food poisoning or contamination scares, are bad for business. The UK Food Standards Agency (FSA) and the European Food Safety Authority (EFSA) were set up to establish better approaches to assessing and managing food risks. They were also an attempt to separate the 'science' from the 'politics' of decision-making. While regulations on new technologies such as GM crops, cloning and nanotechnology are criticised by some for stifling innovation, there remains confusion over the real nature of regulatory controversies. Far from being simply 'pro' or 'anti' science or technology, many of the most serious and intractable issues concern the appropriate directions in which to steer innovation.

The following is a report of the March 2012 meeting of the UK Food Ethics Council Business Forum, which explored how we manage existing and emerging risks and where ethics fit in decision making. The speakers were Andrew Wadge, Chief Scientist at the Food Standards Agency and Andy Stirling, Research Director for SPRU (Science and Technology Policy Research) and the Management School at the University of Sussex. The meeting was chaired by Michelle Harrison, CEO of the social research company TNS-BMRB and a member of the Food Ethics Council.

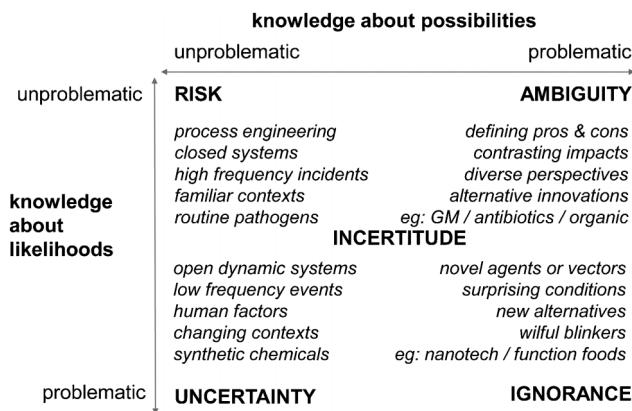
### 2. Definitions

A *hazard* is something that can cause harm, such as food-borne pathogens or chemicals. A *risk* is the chance that any given hazard will have adverse consequences, to health or the environment, for example. *Uncertainty* surrounds many risks where knowledge of the risk itself or its probability (likelihood) is limited. The word '*incertitude*' can be used to emphasise the distinct and variable aspects of uncertainty – as shown in the table below (provided by Andy Stirling).

*Risks* are less problematic and manageable, because knowledge of their nature and likelihood is well understood, such as routine pathogens. *Uncertainty* exists where knowledge of hazards may be well understood but likelihoods are less well defined in the case of rare events or where human factors come into play. *Ambiguity* describes a situation where there are disagreements in defining or prioritising the hazards themselves – irrespective of their probabilities in, for instance, GM or antibiotics. *Ignorance* is a situation where all these problems apply – where we are unsure of the nature, scope and likelihood of problems and opportunities. In other words, it is where 'we don't know what we don't know'.

*Risk governance* refers generally to the collection of institutions, arenas, processes and practices through which risks are understood, managed and communicated. *Risk assessment* refers to more particular methods, which seek to understand the nature of risks

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**Figure 1:** Beyond risk: contrasting aspects of 'incertitude'. Political pressures tend to push attention from 'plural conditional' (bottom right) to 'single definitive' (top left) methods. Source: Stirling (2010)

and their probabilities. *Risk management* refers to the procedures by which decisions and wider actions in response to risks are formed, implemented and evaluated. This takes into account factors other than what is known about the risk through risk assessment – for example broader social, economic, political and ethical impacts of intended risk management options.

### 3. Are we focusing on the most significant risks?

Figures for food poisoning in the UK are stark. One million people suffer food poisoning each year, with 20,000 ending up in hospital, at a total cost to the UK of £1.5 bn. For the Food Standards Agency protecting the public from food safety risks is its biggest priority.

Science can help us to understand and prioritise risks to public health from our food supply, but arguably we are not currently putting time and resources towards addressing the most significant risks. Have we got our priorities right when we consider the time and costs of regulating GM foods, when from a food safety perspective no-one has been harmed, compared with the nine million people in Europe made ill by campylobacter last year? Food poisoning, particularly campylobacter in chicken, is an avoidable risk. We can do something about it, yet our risk concerns often lay elsewhere.

For example, dioxins found in animal feed last year in Germany – for which there is no evidence of harm – got a higher profile than *E. coli*, which made 4,000 people sick, of whom 50 died and 2000 were left with damaged kidneys. On their own, such numbers (as indicated by the prevailing science) suggest a misallocation of resources. Whether or not this is so, however, depends not only on the numbers alone, but also on the contrasting dimensions of each kind of risk and their associated implications and importance under different perspectives and priorities. Many factors come into play when risks are managed and communicated.

### 4. The role of science

Science has an important role to play in helping us assess risks. Yet the role of science can be overstated.

Risk assessment often seems to imply precise determination of all relevant factors. This may be the case for well-understood risks such as campylobacter or *E. coli*. But, depending on the nature of the risk, such precise forms of assessment are not always accurate. Under uncertainty, for example with BSE or with endocrine disrupters, it is not possible to be definite about the probabilities that are required in risk assessment. Equally reasonable analyses can yield remarkably different results, depending on the framing of assessment. As a result, it isn't always possible to identify a clear science-based answer. For example, unknowns around risks from Schmallenbergs disease justify scepticism over too much precision.

We therefore need to accept the limits of science; it is not infallible. It is necessary but not sufficient. It can never prove safety; instead often providing only an indication of risks and uncertainties. For example, it is not possible to 'prove' GM foods are safe. So the focus has been on attempting to show that they are as safe as their non-GM counterparts.

It is argued that the beauty of science is its openness. A key aim in scientific research is to open up analysis for others to challenge. Peer review is the 'gold standard' of science. In this way science is a starting point for achieving trust. Respect for science and openness has been at the heart of the way the Food Standards Agency works.

Despite the value of these aspirations, the challenge lies in whether they are always met in practice. And, though science as a whole may be open, individual scientists or organisations inevitably hold particular values and interests, which may influence their interpretations. These need not always be commercial or political interests. Scientific disciplines, for instance, can have interests in emphasising certainty in order to exercise influence. And science is also open to misuse in wider debates. Beyond inherent ambiguities, politicians, business, NGOs and the media can all be guilty of cherry picking science to support their own interests.

### 5. Managing risks

Risk management decisions are never the sole preserve of science. It is well recognised that risk managers need to take account of a wide range of issues when deciding on appropriate courses of action including political, social and ethical factors.

Deciding on the most appropriate course of action can be a difficult task. For example not everyone wants the benefits of milk pasteurisation. Some consumers want the choice to consume raw milk or raw oysters despite the risks. Considering how to take into account consumer autonomy for the minority while also protecting the majority is one example of the challenges of risk management.

It is important for trust and understanding of the outcomes that the same level of openness that applies to risk assessment also applies to risk management. But this is often not the case. Hidden pressures may arise from politicians, business or NGO interests, which are far less open to public scrutiny than risk assessment. Yet it is often 'science' – and specifically scientific uncertainty – that is cited as a reason for a particular course

of action, even when it would be more honest to acknowledge political expediency as the real reason.

## 6. Using the precautionary principle

The precautionary principle was developed to help decision-making under conditions of uncertainty. Although different versions vary, the key ideas are expressed in the 1992 Rio Declaration. This states: '*Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.*'<sup>2</sup>

Despite this clarity, criticisms continue to persist that precaution is always about banning things. Such misrepresentation is often itself expedient. What the precautionary principle actually says is: 'be careful' – on the grounds that various kinds of incertitude mean we're often unable to definitively claim clear or unequivocal risk assessments.

Some are concerned about misapplication of the precautionary principle, arguing that there are always uncertainties. But this is consistent with proper application of precaution, in requiring open explanation and democratic accountability for reasons. It is no more right to hide behind scientific uncertainty than to pretend a definitive risk.

For example, the use of antimicrobial treatment agents to reduce campylobacter in chickens has not been permitted on the grounds of scientific uncertainty. Yet the advice from the European Food Safety Agency (EFSA) does not support this view. In EFSA's opinion such treatments are not harmful to health. The FSA believe that this argument is not due to 'scientific uncertainty', but to other political factors. Likewise, it has also been argued that the ban on Bisphenol A (an endocrine disrupting chemical used in plastic babies bottles) was a political rather than a scientific judgement.

## 7. Where do ethical issues fit?

Where decision-making is ostensibly based so exclusively around 'risk', it is not always easy to see where ethical issues fit in (such as the impacts on animal welfare, socio-economic and environmental impacts or consumer choice). These are not generally considered appropriate as part of risk assessment. For example the FSA has considered the safety of cloned meat and come to the opinion that it can be considered to be the same as non-cloned meat (substantial equivalence) and hence carries no additional risks. But many people are uneasy about the idea of consuming meat from cloned animals. The formal risk assessment process doesn't take account of such ethical concerns. However, such public concerns do influence the decision-making of regulators – and particularly of business. Yet if there isn't a way in which such considerations can formally be taken into account, then 'safety and science' becomes an artificial focus for concerns.

This can be illustrated by the regulation of new GM crops. Broader concerns including intellectual property

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(IP) and ownership, power relationships, potential impacts on non-GM producers, environmental impacts, and contamination and maintaining consumer choice, are not part of the formal risk assessment process.

Arguably, without a 'space' to engage on these broader ethical issues, it is understandable that the issue of GM has become so controversial. So much of risk controversy is really about the politics of technology. The lack of space in which to discuss which way to go through opening up the boundaries means our only tool is risk regulation. This can lead to everyone piling in, often inappropriately. We need a framework for considering wider issues than just food safety that brings into consideration ethical questions.

## 8. Is risk regulation stifling innovation?

There is a prominent concern that each country is involved in a 'race' to advance innovation. But this embodies a misunderstanding of the real nature of technology change. Innovation isn't a single inevitable track, but a series of continuously branching pathways. Once a particular path is embarked upon, it can become 'locked in' and 'crowd out' others. Examples include QWERTY keyboards and VHS videos. When we talk about issues like functional foods or nanoscience, we are discussing alternative directions for progress – where are we, as a society, trying to get to and how can we shape technologies to help us? When we restrict ourselves to discussing these issues merely in terms of 'risk', we can compound lock-in around the pathways favoured by the most powerful interests. It is important to see that technological innovation can take many forms. For example alternative responses to food insecurity include GM – but also other advanced biotechnologies like marker assisted breeding and participatory farmer innovation.

Innovation can also come from different sources. For example Making Local Food Work has demonstrated innovation in new ways of food production, retailing and distribution that also empower communities and individuals.

Innovation can be both an opportunity and a threat. How it is perceived will determine the response. For example, politicians mistakenly saw opening up space for considering the risks of BSE as a threat and tried to shut down the issue in an attempt to prevent panic.

Resistance to new technologies is not a modern phenomenon. For example, milk pasteurisation was strongly resisted when it was first introduced, with concerns that it would cover up 'dirty milk'. Yet despite its clear health benefits, the delay resulted in a further 65,000 preventable deaths from Bovine TB. The availability of raw milk continues to be a contentious issue today.

## 9. Understanding public responses to risk

Despite perceptions that the public can be 'irrational' in the face of risks, social science demonstrates that we are typically sophisticated at weighing up risks and benefits. We don't expect 'zero risk'. Far from being generally averse to new technologies, benefits and convenience can often outweigh potential risks to generate public

<sup>2</sup> The Earth Summit 1992: *Rio Declaration on Environment and Development* (Principle 15), Rio de Janeiro, 3–14 June 1992.

support, for example with mobile phones. GM crops have yet to provide a direct consumer benefit. Cost is also a key factor.

It is clear that being open with the public about uncertainties need not give rise to undue anxiety. For example the 2000 Stewart Inquiry into risk from mobile telephony concluded that if there were risks (as yet not fully understood) then children would be most susceptible and warned parents to moderate children's use of mobile phones. Far from engendering panic, public acceptance grew.

Under the traditional 'deficit model', it was presumed that the key problem lay in lack of education about risks among policymakers, media and the public. This has been discredited. It is now understood that the reverse is true. There are repeated correlations between the more people think or can be shown to understand (and their overall levels of education) and a tendency to increased scepticism. This is not the same as irrationality.

Trust is often cited as a crucial factor in public scepticism and acceptance. But this also relates to power. It is often addressed, for instance, as always being about trust in the powerful by the less powerful. But what is needed is often more trust by the powerful in the less powerful. Crucial here is the demonstration of trustworthiness. This includes tolerating critical debates and accepting that there are different ways to look at the science.

## 10. The way forward

How can we develop better risk governance? One option is for science advisors to provide plural and conditional advice. Typically, science advice delivers a single recommendation to decision makers. Providing options would place decision making more clearly where it rightly belongs – with Ministers rather than with scientists. Yet this is unpopular as it would expose Ministers to greater accountability and (potentially) blame. It is often more comfortable for Ministers to hide behind the science and so pass the buck back to their advisors. It has been argued that the FSA was set up in part to do exactly this, after the debacle of BSE.

Another example is that of drugs legislation. Under many interpretations, the science is clearly in favour of legalising many drugs. But this is not considered a politically acceptable option. Scientists should not be blamed for providing unwelcome advice. But the life of politicians is also rendered difficult by the intensity of reactions in fora like the *Daily Mail*.

Given the argument for a new 'space' in which to open up debate and consideration, the question then arises as to what this 'space' looks like in practice.

Undoubtedly more openness and transparency is desirable, particularly greater clarity of other social and political factors that appropriately come into play when managing risks or taking policy decisions.

We also need to recognise the limits of risk assessment. The FSA and EFSA need to be able to say 'we are only dealing with a small part of the bigger picture'. Arguably we've lost the ability to see the bigger picture and ask: What is the purpose of regulation? What is it that we want it to achieve? Currently we are largely responsive to new technologies rather than using

regulation or other levers to proactively shape the future direction we decide to go in.

What's needed is democratic space to deliberate and acknowledge scope for plural values. We also need to be more mature about the implications of power. It is a reality – and not necessarily a bad thing. But it can sometimes lead to unhelpful premature closing down of debate and so needs balancing measures.

And we also need to consider how we can all become more comfortable when facing uncertainties. Politicians, in particular, are often uncomfortable with saying 'we don't know all the risks'. Here, the most rational approach in the face of incertitude lies in greater humility about the role that science can play. Scepticism is not anti-scientific; rather it is a vital part of scientific progress and discovery.

Does anyone do technology assessment better? In Germany more questions are often asked, and science is not so readily treated as the source of transcendent wisdom and authority. Yet no-one would argue that Germany has not been technologically successful. Perhaps then, there is something we can learn from our European neighbour about how we handle risk, hazard and uncertainty.

## About the authors

**Andrew Wadge** started his career at Westminster Medical School carrying out research on the effects of environmental pollution upon health. He continued research in this area and was awarded a PhD from King's College London in 1985.

After a short spell of post-doctoral research, he joined the Department of Health where he worked on the health effects of environmental pollution advising Ministers on issues such as asthma and air pollution. In April 2000, he moved to the Food Standards Agency where he headed the Chemical Safety Division and was subsequently made Director of Food Safety. Andrew was appointed Chief Scientist of the FSA in 2006.

**Andy Stirling** is Research Director for SPRU and the Management School at the University of Sussex, co-directing the STEPS Centre (with IDS) and a research group on Sustainable Lifestyles (with Surrey). Andy has an MA in archaeology and social anthropology and a PhD in science and technology policy. He is an interdisciplinary researcher, focusing on challenges around 'opening up' more democratic governance of knowledge, research, science, technology and innovation – exploring issues like: uncertainty, precaution, scepticism; sustainability; resilience; diversity; transformation; progress; participation and power. Andy has served on advisory committees for the EU on Energy Policy, Science in Society, Collaborative Research, Sustainability and Science Governance and for the UK government on toxic substances, GM Crops, public engagement and science advice – as well as for the Royal Society, Nuffield Council and UN IHDP.

## Acknowledgements

Ethical questions around climate change, obesity and new technologies are becoming core concerns for food

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businesses. The Business Forum of the Food Ethics Council is a seminar series intended to help senior executives learn about these issues. Membership is by invitation only and numbers are strictly limited. The Business Forum meets six times a year for in-depth discussion over an early dinner at a London restaurant.

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To read reports of previous meetings, visit [www.foodethicscouncil.org/businessforum](http://foodethicscouncil.org/businessforum).

## REFERENCE

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