Siting a hazardous waste facility: the tangled web of risk communication

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In 1990, the Australian government tried to establish a national hazardous waste incinerator in rural New South Wales. This paper considers the debates over the risks associated with hazardous waste incineration that emerged and the symbolic portrayal of technology implicit in these debates. Risk communications associated with technologies convey a message about how technological systems are shaped, implemented and operated. In this case, government officials succumbed to the temptation to employ an idealistic model of technology in an attempt to gain community acceptance for the proposed incinerator. They depicted incinerator technology as predictable and controllable, and separable from the social context. Opponents reacted by employing a 'worst case' model; they represented incinerator technology as unreliable, uncertain and uncontrollable. Neither side deliberately lied: each put forward a view of technology that furthered its own goals. The polarized positions that resulted are not uncommon in technological controversies, and environmental groups are often branded as alarmists on this account. But there is some evidence in this case study that messages of reassurance also communicate insincerity and leave proponents of a technology vulnerable to having their claims easily deconstructed by the opposition.

Risk communication is a relatively new field of study which has been concerned with the problems arising from the communication of scientific and technical assessments of risk to various sections of the public.1 These problems have largely been construed as technical ones: how to transfer difficult material from 'experts' to 'people' with the maximum effectiveness and the minimum loss of accuracy and content. Perhaps because technical or practical concerns have dominated, debates which have occurred in the literature of risk analysis have apparently had little impact on the field of risk communication.2

A consequence of this is that studies of risk communication have tended to be asymmetrical. It is recognized that members of the public and community groups perceive risks differently from those who construct risk assessments or commission them (if this disparity did not exist, risk communication would be a relatively straightforward business), and it is generally assumed that expert risk assessments are accurate and correct. This being so, the self-imposed task of risk communicators is to disseminate various truths to an audience that is deficient in some fundamental and obstructive way, beyond 'ignorance of the facts'. Those to whom risk assessments need to be communicated are perceived to lack reason or be hampered by an assortment of psychological and political disabilities—bias, special interest, ideological commitment,
and so forth. The asymmetry arises both from the implicit model of communication at work (communication in one direction, from 'top' to 'bottom', from the knowing to the ignorant) and from the assumption that the expert communicators or assessors possess a series of positive attributes (rationality, disinterestedness, political neutrality) denied the public. The notion that risk assessments might be socially constructed, ideologically-driven, and politically 'contaminated' is rarely contemplated. Without wishing to prejudge the issue, we do believe that the acknowledgement by risk communication analysts of some of the best research in risk assessment would not only restore balance but also offer the prospect of more effective communication.

An example of the 'asymmetrical' model is provided in the work of Vincent Covello, Detlof von Winterfeldt and Paul Slovik, who have written extensively in this area. They provide a model of risk communication as a 'message' originating at a 'source' and being 'channelled' to a 'receiver'. Based on wide literature surveys, they summarize the problems that can arise in each of these four aspects of risk communication. The 'message' may contain significant uncertainties and be technically complex. The experts and communicators themselves, the 'source', may fail to gain the trust of their audience, fail to make clear the limitations of their knowledge, disagree with each other and lack an understanding of the interests and concerns of the public. The media, or 'channel', may sensationalize the issue and distort the message. Finally, the 'receivers' of the message may have inaccurate perceptions of levels of risk, strong unshakeable beliefs, an overconfidence in the ability to avoid harm, and difficulties in understanding the information.³

The assumption that inaccurate perceptions are to be found amongst receivers alone is widespread; it is to be found, for instance, amongst those advising engineers on the best ways of communicating risk messages. For example, a recent article in Civil Engineering informs readers that:

> While engineers may be satisfied with technical analyses of real, statistical and predicted risk, laypeople have intuitive fears that create perceived risk. . . . Opposition based on perceived risk can be reduced through information and consultation that begins early on . . . ⁴

A similar view is taken by government regulators, who are particularly prone to advocating the asymmetric model of risk communication. A US Environmental Protection Agency (EPA) administrator expresses puzzlement over public fears over the wrong issues:

> It is an odd fact that communities that would not object to, or would even welcome, a manufacturer of chemicals locating nearby will offer strong resistance to a recycling plant or an incinerator if the fatal words ‘hazardous waste’ are used. It is clear we cannot afford public ignorance in areas where waste disposal facilities are required. . . .

> Not only must we raise, by direct action, the level of sophistication of the public’s thinking about risk issues, but we must also do what we can to increase the number of people who can communicate effectively about risk.⁵

Much risk communication is therefore purposefully undertaken to correct the public's 'false' view of risk and draw it more in line with the 'correct' view of the risk experts. However, risk experts and government officials are not the only ones who communicate about risk. A range of interest groups, environmentalists and community spokespeople communicate risk either by intention or accident. Krimskey and Plough liken
risk communication to 'tangled webs' rather than a 'parallel series of sender/receiver interactions'. This useful analogy of a web is used to denote the fact that there are many types of risk communicators and possible sources of communication, which can easily become entangled; in fact, which do so routinely. It is, argue Krimsky and Plough, not possible to anticipate which particular risk communicator will dominate and what the outcome will be. Behind the analogy of the web, then, stands a rejection of the conventional account of risk communication as the transmission of technical information from elites to the general public. Krimsky and Plough prefer a more multi-dimensional account incorporating 'cultural themes, motivations and symbolic meanings.'

In this paper, we shall be applying and, we hope, extending the analogy of the 'tangled web of communication' through a case study in which we examine the symbolic portrayal of technology and of the relationship between technology and society implicit in the debates over the risks surrounding a hazardous waste incinerator proposed for the state of New South Wales in Australia. At least three points emerge from our case study which we feel are of general interest. First of all, we show that risk communications associated with technologies convey a message about how technological systems work. In talking and writing about technological and environmental risks, people make assumptions about how technology is shaped, implemented and operated. Secondly, we show that in the debate analysed in this paper, what are counterposed by the 'opposing' sides are, on the one hand, an 'ideal' view of technology, and on the other hand, a 'worst case scenario' of technology. We suggest that such polarized models of technological systems can be found in many technological controversies. Thirdly we examine the tacit models of society that are held by the risk communicators and how these shape the way they communicate risks.

Although we fully recognize that risk communications can come from various parties to a dispute, our focus is upon the communications of the authorities who sought to get the incinerator established and environmentalists who opposed the incinerator. This focus has been adopted for three reasons. First of all, we have thought it better in a paper of acceptable length to examine two 'sources' in some detail rather than offer a sketchy account of many. Next, our choice has been governed by the importance of these two groups, each powerful and vocal (and extremely productive). Finally, as the reader will discover, the 'web' is tangled enough with two major participant groups: further threads would make it in all likelihood impenetrable.

The incinerator case study

In 1987 the Australian Federal government joined with the State governments of New South Wales (NSW) and Victoria to form a Joint Taskforce on Intractable Wastes. The taskforce was meant to facilitate a co-operative effort between the three governments to site a hazardous waste incinerator in south-eastern Australia after several attempts by individual states to site such an incinerator had failed because of the strength of local community opposition.

The Taskforce originally consisted of four people. Gavan McDonell, a sociologist and engineer who has conducted previous government enquiries, was appointed as convenor. The other three members were Peter Brotherton, a declared supporter of hazardous waste incineration and a member of the Australian Conservation Foun-
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dation, one of Australia's largest environmental groups; Ray Gillham, an industry representative; and Helen Sjoquist, a town planner, seconded from the NSW Department of Planning. When the first phase of its activities were completed in 1988, Gavan McDonell and Helen Sjoquist left the Taskforce and Anthony Thomas, a senior government bureaucrat from the Northern Territory, took over as convenor.

Incineration is viewed by the authorities, particularly the Waste Management Authority of NSW (the Authority is the government body currently responsible for managing and regulating waste in NSW), as the only safe means of disposing of hazardous organochlorine wastes which they refer to as 'intractable wastes'. These are mostly stored at ICI's Botany site in Sydney, although small quantities of discarded organochlorine pesticides and PCBs are stored outside of Sydney. The authorities have been under pressure to do something about these stores of wastes from sections of the community, the media and the environment movement.*

Some environmentalists support the establishment of an incinerator for this purpose, but a significant number are opposed. Greenpeace Australia has played the most prominent role in opposing the proposed incinerator; it has the resources to allocate a paid campaigner to the issue and has access to a wide information base through its international network of offices, campaigners and researchers. Greenpeace has a worldwide policy of opposition to incineration for two reasons. Firstly, the organization believes incineration is unsafe because the emissions from the stack, leachate (liquids that leak out of buried waste) from the residues and other leakages during handling of the wastes can damage the environment and public health over the long term.

Secondly, Greenpeace Australia argues that providing an 'end-of-pipe' disposal solution will only encourage industry to continue generating these wastes: 'In relation to hazardous waste management, industry and government have a clear choice. They can either follow the incineration path or the clean production path.' Greenpeace Australia argues that 'intractable' wastes in Australia should be stored until they are no longer being generated and 'safer' alternative technologies for treating the stockpile have been developed. It argues that with enough political commitment and funding this could be achieved within about five years.¹⁰

Supporters of the incinerator argue that there is no time to wait for such developments which they say could take 10 or 20 years and even then they might not be satisfactory substitutes for incineration. They promise that generation of 'intractable' wastes will be prohibited by law within the next few years. The incinerator would only have to operate for ten years to get rid of the stockpile and then it could be closed down and the problem solved once and for all. This, they argue, is far preferable to letting the wastes be stored for an indefinite period awaiting technological developments.¹¹

The Joint Taskforce on Intractable Waste worked for three years and was disbanded in 1990. During that time it conducted a public consultation process and came up with a short list of sites for the incinerator. These are all in rural, sparsely populated areas of NSW, hundreds of kilometres from Sydney. Some of these sites have been ruled out by the NSW government for environmental and other reasons but there remain seven sites on the shortlist. Residents at each of these remaining sites oppose the incinerator because they are concerned about the impact it will have on their health, their environment, their agricultural produce and the reputation of the area.

In 1991, in a further attempt to distance the decision-making process from itself,
the governments appointed an ‘Independent Panel on Intractable Waste’ to examine alternatives to incineration, to decide whether to go ahead with a hazardous waste incinerator, to decide where it should be located and to oversee the preparation of environmental impact studies. In the meantime the debate over risks continues. As we shall show, the Waste Management Authority is attempting to persuade concerned residents and the wider public that the risks associated with the incinerator are minimal and therefore acceptable, while Greenpeace Australia is campaigning against the incinerator, arguing that the risks are too high.

Although environmentalists and the government authorities have essentially drawn on the same body of knowledge and literature, they have assembled diametrically opposing arguments by selecting differing ‘facts’ and by highlighting some aspects of the literature at the expense of others. An indication of the chasm between the two is suggested by the definitions each employs of the ‘hazardous waste incinerator’. The Waste Management Authority of NSW which is charged with building and operating the incinerator describes a hazardous waste incinerator as ‘an industrial facility which safely converts intractable wastes into harmless components.’ Greenpeace Australia, the foremost critic of the proposed incinerator, takes up this use of the words ‘safely’ and ‘harmless’ by proposing that ‘even the most modern incinerators pump out persistent and bioaccumulative toxins and spread them onto the land and into the air and water.’ There would appear to be little room for dialogue, and still less for compromise, when the basic definitions of the technology in dispute are themselves controversial. That, perhaps, is the point: the controversy is about basics.

Closer attention to the arguments points to the fact that the main difference in the arguments between the two sides arise because Greenpeace emphasizes a ‘worst case’ scenario and talks about what can go wrong with an incinerator, while the Waste Management Authority emphasizes a ‘best case’ scenario and highlights how well an incinerator could operate in ideal conditions. Each side has employed a different, if not totally conscious, model of how technological systems work. We suggest, therefore, that the risk messages being conveyed by each group embody symbolic communications about the nature of science and technology as well as the intended communications about risk.

Symbolic communications about technological systems

The model used by the government supporters of the incinerator is the traditional ‘naive’ one that a technological system can be built and operated to behave in an ideal way. The Joint Taskforce stated that:

Excellent design and the best equipment must be complemented by the establishment of the necessary systems and procedures and the requirement for unfailing compliance with them.14

This view that every part of a technological system and everyone associated with it can be expected to unfailingly follow carefully defined rules in which uncertainties are peripheral has traditionally been fostered as part of the process of legitimation of technologies.15 It carries two assumptions which we shall now consider:

1. A facility such as an incinerator will routinely achieve the performance that it was designed to achieve.
2. There will rarely be any significant deviation from routine operation, which is a way of saying that accidents will seldom occur.

1. Routine

The most common measure of performance of an incinerator is the Destruction and Removal Efficiency, which is based upon the measurement of certain preselected chemicals emitted during trial burns in optimal conditions. The aim is to measure what proportion of the waste material fed into the incinerator remains, undestroyed, in the gases going out of the chimney. This measurement is normally expressed as a percentage. The proposed Australian incinerator will be designed to achieve 99.9999% efficiency and it is assumed that it will operate at this efficiency throughout its lifetime.16

Destruction and Removal Efficiency is a measure that embodies assumptions of ideal technology in two ways. Firstly it is measured during optimal conditions when the feedstock, feed rate, fuel and operation of the incinerator are carefully controlled. In 1985 the Science Advisory Committee to the US EPA noted that:

Research on the performance of incinerators has occurred only under optimal burn conditions and sampling has, on occasion, been discontinued during upset conditions which take place with unknown frequency. Even relatively short-term operation of incinerators in upset conditions can greatly increase the total incinerator emitted loadings to the environment.17

Secondly, by ignoring the formation of new chemicals from partial destruction of the wastes or chemical recombinations of molecules, the Destruction and Removal Efficiency measure carries with it another assumption about ideal technology. This is that the wastes are either completely destroyed, down to their simplest components, or they remain intact. The Science Advisory Committee to the US EPA has also been critical of that Agency’s dependence on the concept of Destruction and Removal Efficiency because it ‘does not fully address either partial oxidation or chemical recombinations which may create new toxic compounds.’ Because of this, they warn, it is an incomplete measure which is ‘not useful for subsequent exposure assessments.’18

The Waste Management Authority of NSW quotes the design specification of a Destruction and Removal Efficiency of 99.9999% as an advantage of the proposed incinerator; in several places its literature portrays what is undoubtedly an ideal process. For example, the incinerator is described as follows:

It is an industrial facility which safely converts intractable wastes into harmless components—water, carbon dioxide, inert ash or slag and common inorganic salts like sodium or calcium chloride.19

It would be wrong, all the same, to characterize the supporters of the incinerator as ignoring the problem of dealing with the products of incomplete combustion. Instead, they characterize these products as a normal and familiar (and therefore predictable) part of the technological system which can be controlled to the point where they are insignificant. The Authority points out that all combustion processes, including home heaters and car engines, create ‘minute traces’ of these products which are generally accepted (and are, of course, familiar).20 A member of the Joint Taskforce argues
along these lines that, if one were to oppose the incinerator on the grounds of the potential danger of its by-products,

consistency would appear to require us to oppose all of these other incineration processes, which are very much more polluting as well. Even public transport would probably have to be restricted to rickshaws, pedicabs and yachts.21

The Taskforce also argued as follows:

High temperature treatment, modern, advanced flue gas scrubbing and neutralization reduce these quantities to the point where many of them are virtually unmeasurable when they leave the stack.22

The Waste Management Authority has concentrated on one class of these products, dioxins and furans, and argued that ‘the calculated maximum emission’ of these from the proposed incinerator will be \( \frac{1}{20} \) g per year as compared to \( \frac{1}{4} \) g for an average bushfire.23 This figure is based on the standards the Authority proposes to set for the incinerator and reflects a further confirmation of the model that the control of complex technological systems is simply a matter of appropriate design and rule setting.

The Waste Management Authority has largely ignored other pathways of toxic waste into the environment apart from the stack, stating that other waste products from the incineration process ‘will not be toxic and will be safely disposed of on-site’. They argue that because the incineration process will operate under a slight vacuum ‘any leak would always be inwards rather than outwards.’24 Handling and transport are viewed, like the rest of the technological system, as operating ideally and according to rule: ‘with proper containment, supervision and adherence to the Transport Code, the wastes can be transported safely and efficiently.’25

2. Accidents

When the Waste Management Authority discusses emissions from the proposed incinerator, it only deals with routine emissions that are discharged as a result of normal, accident-free operations. No mention is made of emissions that could occur during upset conditions or as a result of an accident: the unstated assumption is that accidents will seldom occur. Similarly, much of the research and development in the last few years into incineration technology has focussed on reducing routine or ‘normal’ emissions from the stack, particularly dioxin emissions. Mark Tweeddale, Professor of Risk Engineering at the University of Sydney and a specialist in risk management, has commented that:

management of environmental protection still concentrates on steady-state emissions (e.g. from stacks), and gives little attention to recognition and management of risks to the environment from abnormal and unexpected mishaps.26

Various accounts have been given of technological systems and of why accidents happen. The sociologist of science Brian Wynne gives several examples to show that real operating systems do not follow the rules by which they ‘officially’ operate even at the best of times. Indeed, as he writes, with reference to technological systems, ‘if the
rules were followed to the letter, the system would grind to a halt. One example he gives is of the failure of the Challenger space shuttle which exploded spectacularly when the O-ring seals failed. The seals had been shown to be faulty in previous flights although this had not caused any accident. So, what of the logic of those who knew about this but allowed the shuttle launch to take off? Wynne presents it as follows:

This component shows behaviour which is abnormal according to our original design-performance rules; however in several launches it has shown less than adequate performance without incident; its failure has been apparently within acceptable bounds (which we have made up under negotiation from experience as we went along).

According to Wynne the experts came to accept O-ring damage and leakage as the new normality; failure itself was redefined. Any technological system requires the 'continual invention and negotiation of new rules and relationships' in order to operate smoothly. The simple view, that there should be no deviation from the formal operating rules, would, Wynne says, paralyse many technologies if it were fully enforced.

Trevor Kletz, a chemical engineer who has written many books and articles in engineering magazines about accidents and how they happen, describes several situations which support Wynne's hypothesis. One, for example, is of a serious explosion in a factory handling high pressure ethylene. A badly-made joint leaked and the ethylene was ignited by an unknown agent. Until that time poor joint-making had been tolerated because it was believed that all sources of ignition had been eliminated. Kletz puts this failure down to a lack of communication between this factory and others under the same ownership where this assumption would have been questioned.

However in the naive view of technological systems that is normally portrayed to the public, accidents are labelled as 'human error' as if they involved drastic departures from normal rule-bound operating practices, and as if to exonerate what Wynne describes as a supposedly separate mechanical, non-social part of the system. So, the following two assumptions appear to be built into the design of technological systems:

1. That organizations can operate with perfect communication; and
2. That expert people are not prone to distraction, illogic or complacency.

It is this view of technology that the Waste Management Authority literature appeals to and relies upon. A formal risk assessment has not yet been done for the proposed incinerator. However the Waste Management Authority and government officials seem confident of the results of such assessments and have not felt it was necessary to wait until these assessments are done before communicating about the safety of the incinerator.

An alternative model

Greenpeace, which has made public its opposition to the proposed incinerator, has put considerable emphasis in its publications on the things that can go awry with incinerators. The organization's campaigners have analysed the same body of literature employed by the authorities supporting incineration, including scientific articles
and government reports. The database, as it were, is the same, but in recovering it, Greenpeace has sought to uncover uncertainties and throw into question the naive view of technological systems and replace it with one that portrays complex technological systems as unpredictable and uncontrollable, as will be shown below. To the rule-governed behaviour invoked by the Waste Management Authority, Greenpeace counterposes a version of Murphy’s law: Watch out because everything that can go wrong, is likely to go wrong.

Greenpeace stresses departures from the ideal. It points out that ‘no anti-pollution control devices achieve full particulate removal’.33 Moreover the types of problems that are associated with incinerator technologies are listed along with the types of failures that might lead to upset conditions. But no probability is attached to these problems and failures so that any reader lacks a notion of just how likely they are to occur. Greenpeace Australia argues as follows:

In real-world operation even the most modern and well-maintained incinerators deviate from ideal performance. These deviations—called combustion upsets—vary in severity and duration, ranging from explosions and flameouts to minor perturbations in small portions of an incinerator for brief periods of time.34

The concept of Destruction and Removal Efficiency (discussed above), which is more typical of optimal operating conditions, is also criticized by Greenpeace both because the concept fails to take account of the products of incomplete combustion and because it is an inaccurate measure. Destruction and Removal Efficiency measurements, the organization claims on the basis of references to scientific papers, ‘have been found to be highly inconsistent and unpredictable over periods of time’.35 Other scientists referred to by Greenpeace have cautioned against assuming an incinerator is operating typically during a trial burn because ‘complex mixtures of chemicals including metals, halogens and other elements’ are more typical of routine hazardous waste incinerator feeds. They argue that such deviations have a significant impact on the environment and claim that incinerator equipment and pollution control devices grow less reliable with advancing age.36

Greenpeace Australia also emphasize fugitive emissions ‘during routine storage, handling, and transport’ and accidental spills during transfer and transport. For them such incidents are the norm rather than the exception. They point out the failures and controversies surrounding the worst performing hazardous waste incinerators in other countries as examples of what could happen. They do not differentiate between older and newer technologies in this context or differing legal standards. Whilst the Waste Management Authority claims that people living near incinerators have no complaints, Greenpeace quotes individuals said to live near such incinerators and their claims of ill-health as well as clusters of cancers or eye defects from areas surrounding such facilities.37

Greenpeace Australia highlight the uncertainties and lack of knowledge surrounding hazardous waste incineration. In one of their publications they have a whole chapter on ‘Unknowns and Uncertainties in Incineration Technology’.38 In another they claim:

Published scientific literature, industrial papers, and United States Environment Protection Agency (US EPA) research reports refer repeatedly to the general paucity of critical information on hazardous waste incineration processes, performance and impacts on public health and the environment.
The rudimentary toxicological information about high-dose exposure to those few individual chemicals which have been identified in stack gas emissions gives no indication of the potential effects of long-term, low-dose exposure to the diverse mixture of chemicals released from incinerators. Their emphasis on the uncertainties is partly aimed at countering the claims of government authorities that incinerator technology is 'proven' technology; they say that in fact the technology 'has not been shown not to have harmful effects'. Greenpeace focus on the possible products of incomplete combustion and how little is known about them and talk about their 'potential' impact on health and on the global environment. 'Of the thousands of individual PICs that may be formed, approximately 100 have fully been identified.' They give long lists of chemicals that have been identified as products of incomplete combustion in a range of incinerators. The chemical names are mostly meaningless to the lay public but the sheer quantity of names such as ethenylethylbenzene and trichloro-fluoromethane can give a lay audience the impression of great quantities of dangerous chemicals.

For Greenpeace, the mere identification of these chemicals in the emissions and ash is enough to condemn a facility. This is because they do not accept the concept of threshold levels of chemicals. In other words they do not accept that there is a level of exposure which does no harm.

Carcinogenic and mutagenic effects for any chemical are thought to follow a no-threshold model by which even one molecule of a carcinogen or mutagen can initiate mutations and replications leading to disease (Kamrin 1988, Epstein 1989). Some reviewers have suggested no-threshold models for specific neurotoxic (OTA 1990), developmental (Shane 1988), and reproductive (Shane 1988) effects associated with exposure to any synthetic chemical.

Models of society

The debate over the risks of hazardous waste incineration has tended to focus on technical factors and neglect social and political factors. Both the Waste Management Authority and Greenpeace have tended to do this although they have divergent views of the social institutions who would be responsible for running and regulating an incinerator. Such views implicitly shape their discourse, as we will show. This neglect of the social dimension is characteristic of the public face of technological controversies and to some extent reflects the desire of governments and experts to limit debate to areas that give mainstream groups advantage over their opposition in terms of access to information and public credibility. The willingness of Greenpeace to go along with this indicates firstly, their dependence on mainstream scientific literature; secondly, their powerlessness in terms of their ability to set the agenda of the debate; and thirdly, their dependence on an international research and information base which is unable to concentrate on the local social context.

In the case of the Waste Management Authority, their neglect of the social dimension and their assumption that the past record of the regulatory institutions is irrelevant implies that they believe these institutions will behave ideally. The Waste Management Authority has consistently argued that 'The incinerator will be designed to meet the toughest standards in the world for such facilities.' In doing so they have employed an idealized model of legislation which downplays the social context of its
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implementation. In fact the implementation of standards requires an on-going interaction between competing interests such as the regulatory authority and the regulated, the nearby community and the government as well as other interested parties. It generally involves adaption, compromise and negotiation. Wynne argues that to ignore these social forces and their ability to shape the regulatory process is to relegate ‘downstream actors or “implementers”, and associated organizational complexities, to the role of the merely mechanical (decision-less) enactment (or obstruction) of policymakers’ “decisions” or rules’.44

In the Australian context, the implementation phase tends to be all-important because of the wide discretion granted to the regulatory authority. Regulatory procedures and standards tend not to be specified in the legislation but are left open for the government regulators, such as the State Pollution Control Commission in NSW, to develop and enforce as they feel is appropriate. Standards tend to be established as guidelines or objectives and are not legally enforceable. Even where they are legally enforceable, they are set in negotiation with those being regulated. Standards that are expensive or onerous to achieve are unlikely to be enforced by Australian authorities.45 For these reasons the equation of standards with actual performance is an idealization.

The Swedish incinerator has often been invoked as an example of what can be achieved and as a model for the proposed Australian incinerator. The Waste Management Authority argues that background levels of dioxins and furans in the milk of cows living near the Swedish incinerator are lower than the national average and that dioxin levels in human breast milk in women in Sweden have shown a progressive reduction during the lifespan of the hazardous waste incinerator facility in that country.46 In like fashion, the Joint Taskforce has pointed out that the risks from incinerators in Sweden were tens of thousands of times less than the risks from the pollution caused by car exhausts, wood-burning stoves and industries in Sweden.47

The choice of the Swedish incinerator as a model involves a number of interesting, related assumptions. The first is that the levels of dioxin in Sweden are causally related to the performance of their incinerators, especially the hazardous waste incinerator. The second is that the difference between the performance of incinerators in different countries can be accounted for by differences in technology rather than differences in social context. The third is that technologies are transferable from country to country without adaption to social context. The authorities have assumed that an Australian incinerator would perform as well as the modern Swedish incinerator which has a better environmental record than many other incinerators in Britain or the US. They argue that the reason incinerators operate poorly in the US and Britain is that they use outdated technology and furthermore that Australia will not face that problem because it will be adopting the most up-to-date incinerator technology.48 No credence is given to the possibility that the socio-political context in Sweden may lead to such factors as more careful operation and tougher regulation of their incinerator than occurs in Britain or might occur in Australia.

Wynne argues that although social assumptions shape expert risk analysis, this is not done deliberately to bias the outcome. Rather it is ‘more a reflection of the structural role of scientists in the decision-making system, along with the narrowness of scientific education’.49 This raises the question of the extent to which the models of technology and society being portrayed through risk communication are consciously and deliberately chosen to further the communicator’s interests or, conversely, the extent to which they reflect ‘less conscious “deeper” identifications with different
social institutions, cultural styles'. Might not these models be unreflectingly accepted by the communicators who have been socialized to accept particular versions of reality without too much reflection?

In terms of the portrayal of technology, it is unlikely that the engineers so prominent in the Waste Management Authority are unaware of the discrepancies between how a technological system is designed and how it operates in the real world, and—what follows from this—the scope there is for accidents. Australia’s Institution of Engineers has openly recognized that engineers have tended to portray an idealistic view of what they can achieve. A paper circulated to engineers at the end of 1990 titled ‘Are You At Risk? Managing Expectations’ came up with this intriguingly-worded piece of wisdom:

We know (or should know) that our models are limited in their ability to represent real systems, and we use (or should use) them accordingly. The trouble is that we are so inordinately proud of them that we do not present their limitations to the community, and leave the community with the impression that the models are precise and comprehensive...

This (veiled) admission notwithstanding, anyone concerned to promote an unpopular or controversial technology often finds that the naive view of it is far more reassuring than a more realistic image. What follows is that in risk communication with the public, there is a strong, indeed irresistible, temptation to employ the more naive model. However, perhaps the same cannot be said for social models, since engineers are not more critical about the working of society, and perhaps a good deal less so, than other middle-class professional members of society. In Australia, engineering education lacks any sociological/psychological training and often it is students who lack people-oriented skills that choose engineering as a career. Engineers are often criticised for neglecting the human dimensions of their designs, for not taking account of how people behave under stress, and of how long it takes people to process information and to respond to that information. Moreover, engineers and bureaucrats as public servants are likely to take a more optimistic view of how reliable and trustworthy government institutions are than would outsiders.

Whilst the Waste Management Authority and to a lesser extent Greenpeace Australia neglect the social control aspect of the incinerator, the communities likely to be affected do not. Wynne has shown, through a number of case studies, that the public make rational assessments of risk based on the ways in which those risks are controlled: ‘this includes institutional judgements of the performance, attitudes, openness and overall “social demeanour” of the relevant industries and regulatory bodies’. People make these judgements by looking at the past behaviour of the firms and government authorities involved.

This is certainly true in this case as well. The natural inclinations of many of the people living in targeted areas is to assume that government authorities are trustworthy and to align themselves with the conservative government rather than with ‘greenies’. Rural people in NSW have traditionally voted conservatively and have often conflicted with environmentalists over their use of agricultural chemicals. Their level of trust in the government has probably been higher than the average for the population as a whole. Many have found the alliance with Greenpeace difficult. Those leading the campaigns against the incinerator have used Greenpeace for information but have preferred not to have Greenpeace representatives speak at their rallies and public meetings for fear of alienating their local communities.
Despite these inclinations these communities have united strongly against the proposed incinerator and have come to distrust the authorities who are trying to site the incinerator. They are more inclined to take on Greenpeace's version of the incinerator than the government's. This can be partly explained by the tendency in those who are most likely to be affected by a technology of being more concerned about what might go wrong than about what might go right with it. But this tendency has been reinforced by the unintended and inadvertent communications of the government itself, which have conveyed messages about both the safety of an incinerator, and the institutional behaviour of the organizations responsible for constructing, operating, monitoring and regulating a hazardous waste incinerator near them.

**Unintended messages**

The decision to site the incinerator in rural NSW hundreds of kilometres from the main source of the waste in Sydney conveyed a powerful message to rural people that the incinerator was too dangerous to be sited near so many people in Sydney, and it was this message that spoke loudest to them. The Taskforce has tried to explain the decision as follows:

The Taskforce is convinced that there is no technical reasons why the incinerator cannot be sited in the same way as any other industrial plant of a similar type. This has been done successfully overseas. However, it is likely that the public in general would prefer the distance separating the facility from residential areas to be greater than would be acceptable for more familiar industrial plants of a similar type. This is likely to rule out its location in a congested, fully-developed industrial area. Other siting criteria also communicate hazard to the community. The Taskforce said that within a buffer zone of about 1 km radius, ‘there should be no supply oftake of urban or town water supply, for irrigation, or for intensive agricultural purposes’. It has also stated that for a combination of technical and perception considerations it is essential the site be away from environmentally sensitive areas such as wetlands, national parks and significant streams and lakes. The people of Corowa, seven hundred kilometres from Sydney, were particularly incensed when their area was chosen in October 1990 by the Taskforce as the preferred site for an incinerator since the location was less than 2 km from the Murray River, one of Australia’s major waterways supplying drinking and irrigation water to three states. ‘Is the Murray not a significant waterway?’ they asked government officials at an angry public meeting. The failure of those officials to give what locals considered to be an adequate answer to this and other questions communicated more to the audience than all the purposeful, reassuring statements they made all evening.

When the government finally backed down on Corowa as a site in November 1990, stating that it was unsuitable due to its proximity to the Murray River and a large number of wells, it too communicated more to the people living near other nominated incinerator sites about the dangers of an incinerator than any environmentalist’s conscious statement could have done. The contradiction between official statements of reassurance and other less conscious statements of risk does nothing to reinforce trust in the government.

Otway and Wynne say of this type of inadvertent communication: ‘This tacit organizational “body language” may trigger quite legitimate inferences about risks
and their management, which are more powerful than any carefully designed formal communication." In fact the Taskforce’s three-year public consultation process ended up conveying to targeted local communities the impression that they were to be sacrificial lambs and that the government and its bureaucracy could not be trusted to do the right thing by them.

The Taskforce sought to direct and shape the debate and for this purpose it hired the firm Community Projects P/L, which had already smoothed the way for other controversial projects. The Taskforce publicly stated that ‘By providing a framework for public involvement, the form and direction of this involvement can be managed in the public interest.’

Before nominating any preferred sites for the incinerator, the Taskforce and its consultants attempted to gain broad public support for the incinerator in principle. The Taskforce endeavoured to have the public debate about the incinerator take place without input from the people who would be most directly affected, the local residents. It stated that it wanted to achieve ‘active public recognition that the proposal is in the public interest’ by limiting ‘destructive conflict’ and ensuring that the concerns of vested interests and affected individuals ‘do not frustrate the public interest’. Support was particularly sought from environmental and community interest groups. The local councils were approached. Some Councils did express interest on the basis of information given to them by the Taskforce and without referring the question to the broader populace, but as soon as these areas appeared on a public shortlist of sites, community reaction was hostile and all Council support was withdrawn.

The conducting of the consultation process by the Taskforce before the selection of a site was a way of attempting to control the risk communication process, socially constructing the debate and denying access to it of the people to be targeted. When the Taskforce went out to invite submissions from local residents in country areas, its carefully worded messages cleverly left out the word ‘incinerator’. For example in a letter to various media outlets the Taskforce asked them to broadcast a message inviting submissions. It stated: ‘An Independent taskforce, set up to advise the Commonwealth, New South Wales and Victorian Governments on the Minimisation and Management of Intractable Waste, is seeking public comment on its latest findings and recommendations . . .’. When community groups in Corowa (the first site chosen by the Taskforce for the incinerator) received letters similarly worded inviting them to a public meeting, few bothered to attend, not realizing it had anything to do with a hazardous waste incinerator being put in their neighbourhood. Corowa residents claim that invitations were sent to business groups, community service groups and councillors but not to local environmental groups in town.

When the site was announced, their claims that they had not been consulted were denied by the Taskforce which pointed to these invitations and media announcements. However the damage was done. The people of Corowa and of the other shortlisted sites felt that they had been excluded from the consultation process and that this facility was being hoisted on them involuntarily.

There is also some evidence that messages of reassurance inadvertently communicate insincerity and dishonesty. The contradictions and incongruities that arise from the need to reassure rather than openly inform, some of which were covered in the previous two sections, are easily picked up by those who are likely to be most affected and are amplified by opponents. For example, the government supporters were not averse to beating up the dangers of storing the wastes whilst downplaying the dangers of transporting them:
intractable waste, either stored or dispersed represents an unacceptable risk to us all, either through the danger of food chain contamination or the risk of uncontrolled warehouse fires.70

Yet when discussing transport they claimed that the amounts of waste to be moved would be ‘extremely small, compared to the enormous quantities of hazardous new products’ safely transported each day.71

It is only when these materials become ‘wastes’ that they are suddenly perceived as environmentally threatening and a safety or transport hazard. This is a fallacy. Wastes are no more (and frequently less) hazardous than original products.72

Neither side is altogether consistent. Greenpeace is not averse to invoking the concept of the ideal technological system. ‘For hazardous wastes currently held in storage (e.g. Australia) treatment systems must be developed that do not emit any toxic, persistent and bioaccumulative compounds into the surrounding environment.’73 Yet Greenpeace could afford to be inconsistent because it was not asking the local residents to rely upon it, but rather supplying arguments that they could use if they wished.

An idealized portrayal of a technology is easily discredited and only has appeal to those who want to be reassured. The Councils who put forward expressions of interest in the incinerator on the basis of the glowing reports of the Taskforce ambassadors only needed to realize that there was another side to the story, that safety issues were not so clear cut as had been portrayed, to feel duped. In this context reassurance can backfire and be interpreted as salesmanship or even dishonesty, and trust is destroyed. When questioned over his about-face on the incinerator on ABC Radio, Corowa Shire President, Keith Barber, claimed that he had accepted a Taskforce report about the incinerator but had subsequently become aware of opposing expert views about the incinerator’s safety. He argued that the Shire Council had not been given enough information.

Almost all writers on the topic of risk communication stress the importance of trust.74 Most also recognize that the acknowledgement of uncertainties is an important element of this. Hance and his colleagues advise that ‘Learning to say “I don’t know” may be one of the most difficult risk communication lessons.’75 However, as they also point out, trying to cover up uncertainties leaves government authorities extremely vulnerable, especially if there are environmentalists ready and eager to uncover them. Thus, there is a real dilemma for communicators. As Krimsky and Plough point out, making scientific uncertainty explicit can ‘reinforce anxiety and reduce the public’s confidence’.76 However, if the opposition is going to do it anyway, the frank admission of uncertainties is more likely to foster trust in the communicators.77

The focus for most people studying risk communication has been on the ability of the communicator to instil trust in the public.78 The aspect that is too often forgotten and yet far more important, if a technology is to be accepted, is the need for the public to trust the people who will construct, operate and regulate the technology. A US study has found that people surveyed about their reactions to a technology frequently made the point that even if the technology was flawless, ‘the people executing the plan and managing the technology would inevitably create serious problems’.79 A history of unsafe industrial practices, chemical spills, problem cover-ups and poor regulation will communicate more to a community than any technical presentation, no matter how honest and credible. A Sydney environmentalist who favours the establishment of an
incinerator in principle but has doubts about how it would be operated in practice points out:

Conservationists . . . believe that governments themselves are creating fears about waste and other chemical issues by their unnecessary secretiveness, poor record of control and failure to initiate a genuine process of consultation. . . . On a range of technical/public health issues, both state and federal governments' responses to problems involving chemicals has been weak, indecisive and unconvincing. The old adage that actions speak louder than words needs to be considered with respect to risk communication.

Conclusions

Harry Otway has drawn a distinction between two kinds of risk communication. One is used to persuade people to accept policies or technologies and their associated risks: 'in essence it encourages passive compliance with the intentions of those providing the information. It is fundamentally manipulative.' The second, a more ideal form, is aimed at fulfilling the information needs of the audience so as to enable them to make their own decisions. Much of the interest in risk communication has come from frustrated government officials and others who have experienced difficulties in siting facilities such as hazardous waste treatment plants. Government and industry experts, seeking to reassure the public, promote an idealized image of technology. They prefer to portray technology as predictable and controllable. The social institutions and structures within which the technology is embedded are left out of their estimation of risk because they do not see them as relevant. They assume that they will perform their roles perfectly. As a result, the case studies of poorly performing incinerators in the US and Britain presented by Greenpeace are explained away in terms of outdated technology and loose emission standards. They are dismissed as irrelevant to the Australian incinerator which will utilize the latest technology and the strictest standards.

In this scenario, past mistakes and bad experiences are not relevant, and there is no need to discuss the record of the existing Australian institutions in the area either of operating or of regulating technological systems. The world that they want to create is one of order where everything is under control, where the authorities can be trusted to do the right thing. Krimsky and Plough point out that:

A scientist speaking to a community about the health effects of a hazardous waste site is part of a political ritual that aims to evoke confidence and respect. The technical information in the message is secondary to the real goal of the communicator: 'Have faith; we are in charge.'

The environmentalist argument which promotes a view of technological systems which are unpredictable and uncontrollable undermines that goal and so comes under bitter attack:

NSW Environment Minister Tim Moore today advised people to ignore ridiculous scare-mongering statements about the proposed high-temperature incinerator . . . [legitimate] concerns should be divorced from the hysterical lies
and ratbaggery of those who deliberately distorted the truth, in a campaign designed to arouse hatred and fear.84

The resulting polarization inevitably follows from the original formulation put forward by the promoters of the technology. It is reinforced by the media who are unable to discern which technological portrayal is 'correct' and prefer to report the story of the conflict, in a way everyone can easily understand: a conflict between a responsible government doing its best to deal with hazardous wastes, anti-industry environmentalists, and local residents expressing the NIMBY syndrome (Not In My Back Yard).85 Most journalists are unable to sort out whether there is any real threat associated with the incinerator or not and merely report brief statements from each side. For this reason the media have not played a particularly important role in mediating the processes of risk communication apart from the letters pages of the newspapers and debates between protagonists broadcast over the radio. The communication with affected communities and interested groups tends to take place in public and private meetings, conferences, through correspondence, and in brochures and other publications. The media have merely informed the wider public that the controversy is going on and of the players on each side; little further information than that has been provided.

From the point of view of the governments, the risk communication undertaken by the Joint Taskforce and then the Waste Management Authority failed because for them success is when the recipients of their risk message accept their views or arguments. The recent appointment of an Independent Panel is a last ditch attempt by the governments to salvage the situation with four new people who may be able to learn from the ‘mistakes’ of those who preceded them.

But risk communication is better defined as 'an interactive process of exchange of information and opinion among individuals, groups, and institutions'.86 The US National Research Council's Committee on Risk Perception and Communication:

construe risk communication to be successful to the extent that it raises the level of understanding of relevant issues or actions for those involved and satisfies them that they are adequately informed within the limits of available technology.87

Whilst a polarized presentation of information might not be the most ideal way of communicating, the affected communities have had their level of understanding of hazardous waste incineration raised in this case. At recent hearings organized by the newly appointed Independent Panel community representatives displayed what a great amount they have learned of the issues and technicalities involved over the last year.88 However, they are just as opposed to hazardous waste incineration in rural NSW as they originally were.

The reasons for this continuing opposition are in part related to the communication process but also to the substantive issues which the communication process addresses. The Taskforce/Waste Management Authority communication process was flawed because:

1. The portrayal of ideal technology working within perfect social systems was not credible.
2. The effort at reassurance came across as salesmanship.
3. Inadvertent communications conveyed opposite messages from those which were intended.

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4. The failure to consult destroyed faith that the authorities were acting in the community's best interests.

However, even a perfect communication process could not overcome the other reasons for local residents opposing an incinerator in their area. These related to the extent to which they can actually trust the relevant social institutions to construct, operate, monitor and regulate an incinerator in a way that would impose no significant costs (social, financial, emotional, health, environmental) on them or to compensate them if it does. To judge these questions people examine the records of incinerators overseas, contact people who live near them for their impressions, and consider the actions and past records of local social institutions such as the Waste Management Authority and the State Pollution Control Commission. They have found communities whose complaints are not listened to in Britain, leaching chemical dumps in the United States, unacceptable air and water pollution in Sydney—all of which hold lessons for wary residents. The best communication process in the world cannot replace good government.

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This is my judgement based on attendance at the Public Hearing held in Sydney on 6 December 1991.

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