The Search for a Landfill Site in the Risk Society*

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Cette étude examine comment les inquiétudes concernant les risques de l'environnement ont été traitées dans une recherche d'un site d'enfouissement des déchets qu'on a menée récemment à Guelph, Ontario. L'argument sera que les interactions observées entre expert et profane ainsi que le genre de questions soulevées peuvent être comprises en termes de la thèse de la société à risque proposée par Ulrick Beck. En particulier, cette étude montrera comment la science de l'impact de l'environnement a été restructurée pour s'occuper des conditions de la société à risque.

This paper examines how concerns about environmental risk were treated in an landfill search that was recently conducted in Guelph, Ontario. It is argued that the expert-lay interactions observed, and the types of issues raised, may be understood in terms of the risk society thesis proposed by Ulrich Beck. In particular, it is shown how environmental impact science was restructured to deal with the conditions of the risk society.

ONE OF THE MOST PRESSING ENVIRONMENTAL PROBLEMS that modern society faces is waste disposal, and addressing this issue has become an urgent matter for many industrial societies because the space required for disposing of waste is quickly running out (Yearley, 1992a: 34). Dealing with waste is a particularly pressing issue in Ontario, Canada because in 1993, 45% of this province's landfill capacity was lost with the closing of three of its largest landfills (Ontario MOEE, 1993).

The problem of waste disposal has been further compounded by the fact that landfill sites are now known to introduce environmental and health risks through the generation of a toxic solution formed by the mixing of decomposing garbage with rainwater. This toxic cocktail, known as *leachate*, may penetrate the underlying soils of a landfill to ultimately

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contaminate a community's drinking water supply. The exact chemical composition of leachate varies, and remains largely unknown, but leachate concentrations of parts per billion may be lethal; in fact, it has been demonstrated that leachate may even eat through thick concrete (Crooks, 1993: 20). Consequently, unlike the past situation in which landfills were opposed on the basis of nuisance factors and concern over declining property values, today they are opposed for reasons of risks to public health and safety.[1]

The siting of a landfill is a complex problem which involves many different types of consideration. The literature on siting landfills (most of which focus on toxic landfills) reflects the wide range of issues that may be involved. For example, Edelstein (1988) and Eyles et al. (1993) focus on the psycho-social impacts of living near waste disposal facilities; others, such as Hadden (1991), Kraft and Kraut (1985) and Leiss and Chociolko (1994: 206–18), investigate the need for greater community participation in the siting process, while researchers such as Bullard (1990), Capek (1993), Cable and Benson (1993) and Szasz (1994) address issues of social equity and the movement for environmental justice stimulated by responses to toxic and other landfill sitings, while still others such as Crooks (1993) and Murphy (1994: 107–61) analyse the political economy of landfilling and the global waste industry in general. The direction taken in this paper differs from the above approaches because I wish to concentrate on how the issues related to the environmental risks raised in a contemporary landfill siting process may be understood in terms of the broader social and political context, particularly as they relate to the role of science in the public forum. To help do this, I will largely draw on the work of Ulrich Beck (1992) on the 'risk society,' as this perspective strives to delineate a broader viewpoint by focussing on the linkages between prevailing socio-economic forces and issues of environmental risks. It is my contention that although Beck's perspective may be intuitively appealing, there nevertheless has been little done to test and/or apply this particular paradigm at the empirical level (the notable exceptions being the work of Mol and Spaargaren, 1993; Mol, 1994; Shrivastava, 1995; Lidskog, 1996). The empirical data used in the analysis is based on an observational study of a landfill search recently conducted in Guelph, Ontario (located 100 km south-west of Toronto; population, 91,000). In what follows, I will first give a conceptual outline of the risk-society perspective and will then proceed to show how this perspective may be usefully applied to analyse events and issues that arose in the Guelph Landfill Search Process (GLSP).

1. The siting of a landfill often involves dimensions other than economic concerns commonly associated with NIMBYism (see Wexler, 1996 for a comprehensive sociological discussion of NIMBYism). For example, the issue of social equity may arise as landfills (and other risk-producing projects) have been sited in areas where residents belong to relatively underprivileged groups such as African-Americans (Bullard, 1990), Natives (Richardson et al., 1993) and rural residents (Couch and Kroll-Smith, 1994).

Conditions of the Risk Society

Ulrich Beck (1992: 26) contends that the recent past was largely characterized by the logic of the industrial social welfare state in which attention was primarily focussed on the distribution of goods such as wealth, consumer goods, incomes, education opportunities and property. In this earlier period of modernity, industrial risks already existed, but were largely regarded as the "price that needed to be paid for progress." Consequently they did not stimulate political mobilization. The toleration of such risks was bolstered by the economic prosperity of those times. In contrast, Beck contends that the present epoch is one in which greater attention is starting to be focussed on the distribution of the 'bads' or risks produced by industrial production (although Beck makes no claim that the social question disappears altogether). Hence, for Beck, we now live in a risk society in which the formerly latent risks or side-effects of industrialization are increasingly being confronted, thereby leading to a raised public awareness of risk. With this raised awareness, the role of technical and political elites to legitimate or down-play risks starts to be challenged:

> [T]he political dynamism of the ecological issue is not a function of the advancing devastation of nature; rather it arises from the facts that, on the one hand, institutions claim to provide control and security falls short and, on the other hand, in the same way, devastation is normalized and legalized (1995a: 128).

But what is it about modern environmental risks that propel these issues to the top of the political agenda? The question may be partially answered by considering the nature of modern risks.

For several reasons, the nuclear, chemical, biological and environmental risks produced in the risk society are of a different type than those faced in earlier industrial times. First of all, as Beck (1992: 21–22) notes, we now face *global* risks in which the risks are no longer limited socially (they can potentially affect all social classes), physically (they cross political and geographical boundaries), or temporally (they can affect future generations).[2] This of course does not mean that risks no longer have a time, space or social class dimension, but rather that the impacts of modern risks (on both society and health) are much more extensive. Thus, unlike the case in which industrial risks were localized or limited to a factory setting, technologically induced risks today may now have a much more pervasive impact. As we will now discuss, this impact may not only be greater in magnitude, but also more insidious.

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2 The global dimensions of risk may play a particularly important role in a landfill dispute. Gordon and Jasper (1996), as well as Walsh et al. (1993), have found that in overcoming the "NIMBY" charge of simply pursuing special interests, local activists may resort to the employment of a global rhetoric. That is, attempts may be made to show that a local problem indeed has global impacts in order to appeal to a larger number of people and to create a greater sense of legitimacy.

Modern environmental risks may not necessarily be detectable to our physical senses, obliging us therefore to rely on the scientific and technological means of detecting them (Beck, 1987). For example, as previously mentioned, the concentration of substances in landfill-generated leachate that can cause death may be in parts per billion, that is, at a concentration that cannot be tasted or smelled in the drinking water (hence, recourse needs to be made to the methods of analytical chemistry, such as infrared and U.V. spectroscopy and gas chromatography; Tarr and Jacobson, 1987).

The remoteness of present-day risks from lay people's perceptions also means that science becomes the primary institution entrusted with knowledge claims about risks (Lidskog, 1996). In line with this, Shrivastava (1995: 120) observes that modern risks only exist in terms of knowledge about them, and for this reason risks can be magnified, channelled and dramatized by the technical knowledge claims that are made.

Third, modern environmental risks often involve long chains of causal interactions between diverse chemicals and natural agents before the effects are made manifest (and then the effects may only be seen in the future). The inherent uncertainty and complexity of such risks means that the types of risks that are now dealt with are not *accountable* according to the usual rules of causality, guilt and liability circumscribed by the insurance principle of earlier modernity (Beck, 1995a: 2). The risk society therefore is one in which public demands for guarantees of protection from environmental and health risks are made, but cannot be realistically met.

Lastly, the types of risks we now face are caused by our own *decisions*. Modern risks such as chemical pollution, global warming, the thinning of the ozone layer, nuclear accidents, and so on, occur as a result of human decisions to technologically intervene in nature and are therefore unlike the 'natural' risks of yesteryear (such as droughts, hurricanes, etc.). Thus, Niklas Luhmann (1993) notes that the defining character of modern risks is that they are *attributable* to a decision maker. It is with the realization that modern risks are attributable to decision makers that those potentially affected by these decisions now seek to have some input into the decision making process. In other words, the gap between those who make decisions about risks, and those affected by risks is narrowing as the latter increasingly attempt to become involved in the formal risk-management process. To respond to such demands for lay involvement requires the formation of new channels for public access.

Thus, although risk avoidance *attitudes* have probably not changed significantly from the past, public *responses* to environmental risks may indeed have changed as institutionally available channels for participation in risk-management are opened.

For Beck (1992), as well as Giddens (1990), the changed character of the risks we now face (and the public realization of this) has led to the emergence of a new dynamic in which both institutional and individual actors are forced to adapt to the newly emerging characteristics of the risk

society. For example, Beck (1992) claims that the raised awareness of risks means that new issues are brought to the fore: the issue of self-limitation of development, the redetermination of standards of responsibility, safety, monitoring, damage limitation and the distribution of the consequences of the damage, as well as the issue of public trust (see Ali, 1997). Central to the process of addressing these issues is the matter of how the *technical* decision structures which create and manage modern environmental risks are to be modified to allow for a more effective consideration of the environment. This is the subject of the following section.

Science and the Conceptualization of the Environment in the Risk Society

William Leiss (1974) notes that in Western society, the prevailing ideological perspective of dominating nature had meant that nature is no longer conceived of in terms of the "experienced nature of everyday life," but as the "abstract-universal" nature described by the physical sciences. Science therefore represents a mechanism through which nature is subjugated by human beings. This process of subjugation is based on the ability of science to "demystify" nature and on that basis to confidently control it. For Beck (1992) however, science as the great demystifier of the Enlightenment Project has itself become demystified, as the failure of science and technology (manifested in the form of environmental risks) has led a reflexive citizenry to *publicly* question the assumptions, claims and authority of institutional science. It is my contention that this development has led to changes in the treatment of environmental risks, including such changes as the de-monopolization of technical knowledge, changes in the opportunity structures for lay involvement in risk matters, and the opening of technical work to social standards of relevance. These developments will now be discussed in the context of the Guelph Landfill Search Process.

Sources of Data and Methodological Overview

The data for this analysis comes primarily from fieldnote observations taken during the Guelph Landfill Search Process (GLSP), in the period of June 1993 to March 1995. As such, the analysis is based on an observational study in which I attended about sixty public meetings held by the various groups involved, five public workshops, four meetings of Guelph City Council and two press conferences. My overall aim was to gather first-hand information about social processes in a "naturally occurring" context (Silverman, 1993: 11). My specific emphasis was on obtaining information about the *types* of issues raised, how they were treated in the process, and in what context.

As an overt observer, informal discussion with lay participants and city officials was carried out, but no formal interviews were conducted. In particular the local journalist covering the landfill search was very helpful

in providing background information about the actors and historical aspects involved.

As the GLSP was consciously designed to be an open process, *all* documentation used in the process, including: meeting records, environmental assessment documents prepared by the technical consultants, government documents prepared by the City and Province, and correspondence between the different groups involved (including City Council), were photocopied and distributed at the public meetings. In addition to these documents, newspaper articles in the two local newspapers and the University of Guelph newspaper were also consulted. In relation to these articles, I had the advantage of comparing the newspaper accounts with my own fieldnotes, as a check for validity.

An Overview of the Guelph Landfill Search Process (GLSP)

In order to avoid the pitting of the public against the technical consultants that had occurred in a previously unsuccessful search, Guelph City Council wished to adopt a more inclusive process in which all members of the community could voluntarily participate. The organizational structure of the process adopted consisted of a Landfill Search Group (LSG), a Community Advisory Subcommittee (CASC) and Neighbourhood Liaison Groups:

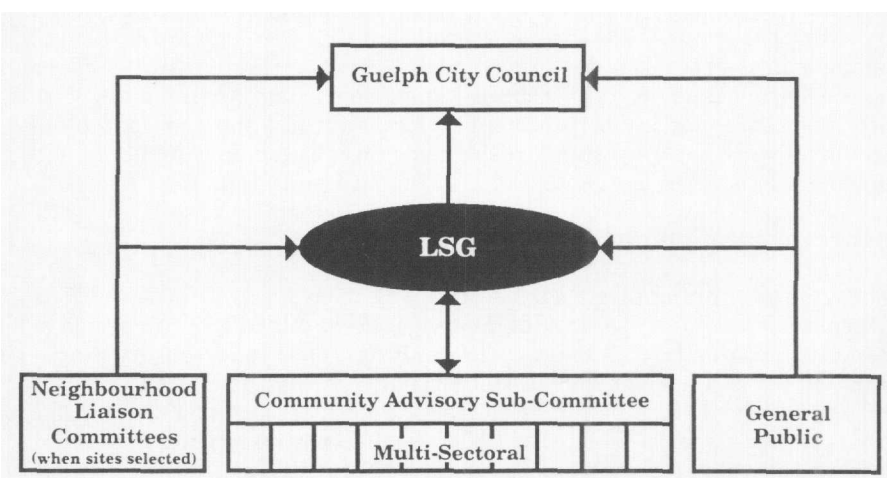

Figure 1.
Organization of Community Involvement in the Guelph Landfill Search Process

Source: Update on the City of Guelph Landfill Site Search, May 1994

The LSG consisted of four representatives from the community (a retired professor of rural development and agricultural economics who served as the LSG Chair, a environmental engineering professor, a geological engineer and an aquatic biologist) and four City Staff members (the Chief Administrator, the City Engineer, the Director of Operations, the Director of Planning and Development as well as two alternatives, a senior planner and the City Waste Management Co-ordinator), as well as their technical consultants.

The CASC consisted of volunteers from a wide range of societal sectors including: business associations, homeowners associations, university and high-school students, environmental groups, public-interest groups, senior citizens and members of service clubs as well as unaffiliated interested members of the public. On average CASC meetings had an attendance of about forty people.

After the LSG announcement of five potential sites, two neighbourhood liaison groups were formed. The first group was known as the Coalition of Residents Against Landfill Sites in the Hanlon and Mill Creek Watersheds (CORALS). CORALS members resided in the annexed area of Puslinch in which four of the five potential sites were located. Unlike the mostly estate-dwelling residents of the annexed area, the members of the second neighbourhood group known as the Victoria Road Neighbourhood Liaison Group (VRNLG) were of a lower economic class and consisted of a mix of senior citizens, young families and university students. Members of the VRNLG opposed the landfill primarily on the basis of social equity:

> We [i.e., residents in the Victoria Road area] have done our share. We have contributed our fair share to the industrial process—the Owens Corning plant is in our viewscape, the Eastview dump is only 3 km away, the abandoned IMICO plant,[3] as are four known abandoned landfill areas, the Better Beef slaughterhouse and Huntsmen Chemical. Yet, the natural preserve in the neighbourhood has been maintained. We've done our fair share of being dumped on, and we want LSG to recognize this (LSG Meeting with VRNLG, July 19, 1994).

The GLSP itself consisted mainly of CASC, LSG, and neighbourhood meetings, as well as public workshops. The public workshops were held to do the technical work related to: alternative waste disposal technologies and ways to site a landfill, development of site-comparison criteria, selection of a method to compare potential sites, and the site-comparison process itself.

In February 1995, the final site considered by the LSG (although opposed by some members of CASC) as suitable for a landfill was rejected by Guelph City Council because of the perceived potential for negative

3 IMICO—the International Malleable Iron Company property was an abandoned industrial site with extremely contaminated soils which required extensive environmental remediation at great cost to the owner. The Ministry had brought charges against the company forcing them to clean up the site, but the property was sold to a religious cult for less than a dollar.

economic impact on the City's industrial development (the site was located near an industrial business park). In the following section I will review issues raised in the GLSP relating to site identification and comparison as well as community standards for environmental protection. This descriptive review of the technical matters pursued in the GLSP will then serve as the basis for subsequent conceptual analysis.

The Identification and Comparison of Potential Landfill Sites in the GLSP

During a public workshop held in March 1994 the public recommended that 48 different criteria be used in the identification of potential sites (and for the later comparison of sites).[4] The vast array of criteria were then grouped into six categories and subsequently prioritized by the public.[5] The protection of the natural environment and public health were both ranked as the most important criteria that should be used in identifying the potential sites. The key aspect underlying the public emphasis was the protection of the community's underground drinking water supply from the risk of leachate contamination. The second key priority area pertained to land-use compatibility. The LSG with CASC then developed a potential site identification method by combining the two highest community-recommended priority criteria groupings into a decision matrix.

The resultant decision matrix outlined the ranking sequence used by the LSG to identify the potential sites. For example, the first choice for the landfill would be in a location that had at least 10 metres of clay (i.e., offering the greatest environmental protection because of the resistance clay offers to leachate infiltration) which was at the same time non-urban (i.e., the least economic and social impact).

As would be expected, there arose much public controversy over the priority ranking of the different cells in the decision matrix. In fact, the exercise of numbering the cells reflects a greater underlying issue at hand, namely, what trade-offs between economic and environmental impacts were acceptable to both the community and to the City. City members of the LSG (and some CASC members, such as those from the Guelph Chamber of Commerce) wanted to ensure that the economic impacts would be minimized even if that meant that the site would have to be located in an area with little protection of the natural environment. On the other hand, most CASC members maintained that protection of groundwater could not be emphasized enough:

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4. These included the following factors: traffic safety, potential for leachate contamination, potential impact due to the inhalation of landfill gases, potential for disease transmission via vermin, potential disruption to aquatic and terrestrial ecosystems, displacement of residences, visual impact of the landfill, compatibility with existing and/or future land use, disturbance of cultural heritage features, capital and operating costs of the landfill, displacement of business, property value loss and so on.
5. The criteria groupings were public health and safety, natural environment, social environment (including land use), economic environment, cultural environment and public services.

> One thing we have learned from this exercise is that the public has identified ground water protection as *the* criteria and not just one of several criteria. The hydrogeological environment cannot be compensated for. Social and economic factors can be compensated for (Guelph City Council Meeting, February 27, 1995).

Other CASC members felt that vacant industrial land should be given top priority to host the proposed landfill because such land may already be (or become) contaminated. Further, it was felt by some CASC members that an industrial site would prevent the future possibility of the construction of low-income housing in the area thereby victimizing the poor (i.e., after the closure of the proposed landfill). To the CASC suggestion of using vacant industrial land, the City Administrator member of the LSG responded that:

> I am very afraid, and I find it very objectionable that CASC's priority is to site the landfill in empty industrial land. I feel that the City does much to have good relations with industry and the Chamber of Commerce. Guelph has invested very much money, for the past forty years, to attract industry and factories to the city (LSG Meeting, March 15, 1995).

In order to follow the ranking sequence set out in the decision matrix, the LSG developed a groundwater protection map by overlaying a depth of overburden map with a surficial geology map. The resultant map was than over-layed by a land-use map so that the various categories of groundwater protection and land use could be identified through cross-classification. For two reasons this procedure was erroneous according to a counter-expert working with CORALS. First of all, the surficial geology map only gave a description of the veneer of the land and did not therefore accurately describe the groundwater protection characteristics of the sites. Secondly, the counter-expert contended that the depth of overburden map did not give any indication of the soil types that were present.

The issues raised by the counter experts served to raise many lay participants' awareness of the uncertainties and errors that may arise in the activities involved in environmental risk assessment and management. Such lay awareness was further reinforced in the subsequent process of comparing the potential sites. In order to compare the environmental protection characteristics of the potential sites, the LSG's technical consultant gathered data on soil types provided by water-well drillers. He noted that such data needed to be interpreted with caution because frequently this particular type of data is not well presented since the well driller only supplies the soil data required by the Ministry. The driller is therefore not as interested in the accuracy of this data as he or she is in the goal of finding water. The CASC objected to the use of such desktop data and insisted that boreholes be drilled on all the potential sites to obtain more accurate information concerning soil types and the depth of overburden.

The LSG Chair noted this expressed public preference and asked the consultant whether drilling boreholes would add any information at all. The technical consultant reasserted his position that there was no need to drill and on this basis, the LSG decided not to drill. This decision led to objections from many CORALS and CASC members:

> We are very disturbed by the fact that hydrogeology will not be given the importance it merits in this landfill search. If LSG is truly serious about protecting groundwater and recharge areas, then the hydrogeology of all potential sites must be evaluated at this stage (Letter from CORALS to LSG Chair, August 9, 1994).

The controversy that arose concerning the hydrogeological data that was to be used in the site comparison indicates the extent to which lay participants in the GLSP were aware of the uncertainties of environmental impact science and risk management. In the following we will describe one way in which these participants responded to such uncertainties.

CASC members felt that data from actual field studies (such as from boreholes) was needed to ensure that the identified sites would indeed provide adequate environmental protection. In response to this perceived need, the CASC developed a set of technical Minimum Acceptability Standards relating to the minimum hydraulic conductivity of soils around the selected landfill site, the minimum distance of the landfill from built-up areas and wells, the requirement that the maximum height of the landfill not exceed 11 metres, and the requirement that the LSG exclude sites that were too small to accommodate a leachate treatment system. According to CASC, these standards were necessary because:

> It [i.e., Minimum Acceptability Standards] is intended to provide a basic measuring point to make sure that, with all the trade-offs we are making, we don't get stuck with something that is bad for the community (quoted in *The Guelph Mercury*, July 28, 1994).

> Why do people want MAS [Minimum Acceptability Standards]? Because people want some objective measure, rather than the reliance on LSG's 'gut feelings.' (Community Liaison LSG Member, LSG/CASC Meeting, August 24, 1994).

The LSG and their technical consultants rejected the Minimum Acceptability Standards because it was felt that they would hinder the ability to carry out the technical work required in designing the landfill. After a series of unsuccessful meetings aimed at reconciling this disagreement, the CASC then went directly to City Council to try to persuade Council to force the LSG to use the community-derived standards. This attempt was also unsuccessful.

In the following section I will discuss how the activities described above (i.e., public involvement in technical procedures and data, and the

development of community standards thereof), may be analysed through the application of the risk-society thesis.

Discussion: Framing Scientific Evidence in the Risk Society

It can be seen that the environment in the GLSP was treated as a physical entity that could be described in terms of hydrogeological characteristics such as the depth of overburden and the hydraulic conductivity of soils. It can be said therefore that the social construction of the environmental-risk problem in the GLSP was largely informed by, and *defined*, in terms of science. However, the presence of competing technical claims clearly indicated that science in the public forum of the GLSP took the form of a reflexive (rule-altering) and not a simple linear (rule-directed) activity. This mode of scientific activity, termed "reflexive scientization" by Beck (1994: 49) is perhaps properly analysed by examining the processes through which definitions and discourse were framed in the GLSP.

According to Dietz, Stern and Rycroft (1989) definitions play a crucial role in environmental-risk controversies. They note that there may arise *competing definitions* of a problem based on the various presumptions of who or what caused the problem, and who or what must be changed to solve it. For example, energy can be defined as either a commodity, a social necessity, or a resource with ecological implications. Each definition will *legitimate* the position of a different set of actors, and will therefore point to a different course of action. As such, particular definitions will lend power to particular interests. Since the GLSP was designed to facilitate the community members' role as advisors to the technical consultants, the landfill issue was *a priori* defined as a technical matter.[6] To define the environmental-risk issue in terms of science meant that a premium was placed on the role of technical knowledge in the process of siting the landfill. The role of knowledge in defining risks in the GLSP is illustrated by the competing hydrogeological claims reviewed above. Notably, competing technical claims also served to raise the lay awareness of technical errors, which in turn highlighted the inherently uncertain character of the science involved with environmental-risks management and assessment. In this connection Lau notes:

> By the institutionalization of counter-expertise, not only is the scientific dissent about facts made public, but it also becomes visible that the methodological basis of scientific research can hardly guarantee the certainty which is expected by the public (1992: 243).

This raised awareness of technical uncertainty and the fallibility of science in the GLSP was a direct consequence of the change in what Eder

6. However, as we have discussed, the opportunity structure of the GLSP did allow other value systems to enter into the technical decision-making process to a certain extent. For example, the issue of social equity was raised by members of the VRNLG and also by CASC (in regard to their concern that after the closure of the landfill the site not be used for low-income housing).

(1996: 206) calls the "opportunity structure of institutional contexts." That is, the enhanced opportunity for lay involvement in the technical aspects of an environmental-risk issue had allowed lay individuals to be directly exposed to the inherent flaws of science (to which they would not normally be exposed). In general terms, such a situation leads to the demystification of science alluded to previously.

This process of demystification of science is in fact a direct result of a general feature of modern environmental risks noted by Hannigan (1995: 80): that is, the fact that environmental problems are particularly vulnerable to contestation because science is unable to give any absolute proofs or guarantees of safety. Consequently, claims about the magnitude and likelihood of the environmental risk in question often serve as the loci for discussion between technical experts and lay individuals, as evidenced in the GLSP:

> Much of the discussion to alleviate the concerns of residents that would be affected by potential problems of the landfill sites has been based on faith in available (yet much of it unproven), technology and human ingenuity. What contingency plans and precautions will be in place to minimize the risks, detect problems and compensate injured parties in the event of unforeseen problems? For example, will a bond be posted by the engineering, operating or consulting firms to demonstrate their confidence in their technologies and abilities and ensure that they are also stakeholders in this challenging project? If not why? What GUARANTEES do citizens have that the site will operate according to its design? (Written question to LSG by VRNLG members, July 11, 1994.)

Wynne (1988: 163) notes that the de-monopolization and public disclosure of technical knowledge may mean that the technical expert is no longer sanctioned by the apparent authoritative power of science. At the same time, however, the technical expert may gain legitimacy as situational realities and socially negotiated measures come to be publicly realized as part of the process of dealing with modern environmental risks. This process of negotiation has the effect of allowing the technical work to be open to the social standards of relevance (Beck, 1995b). In the GLSP this was clearly evidenced by the fact that the criteria developed and prioritized by the public was subsequently incorporated in the site-identification and comparison procedures. Further, the community derived Minimum Acceptability Standards, although not formally accepted by the LSG, did to some degree influence the process outcomes (the community standards were used as general guidelines to inform decisions, discussion and negotiation, rather than absolute criteria for decision making).

The de-monopolization of technical knowledge, the change in the opportunity structures for lay involvement, and the opening of technical work to the social standards of relevance in the GLSP all illustrate changes in the traditional approach to science and the management of risk. Plough and Krimsky (1990) note that at the end of WWII, the newly developing

field of operations research and systems analysis stressed a quantitative-statistical approach to risk analysis. The adoption of such an approach resulted in the marginalization of values in the risk-management process. In fact, Fischer (1990: 24) observes that technocrats normally consider interest groups as their virtual enemy because the latter wish to introduce political and social values into what the technocrats conceive to be a purely technical matter. In the GLSP we have seen a reversal of this approach as an attempt was made to re-insert ecological values in the risk-management process (although admittedly these values were conceptualized in terms of the abstract-universal as opposed to the intuited conception of nature).[7] In this context, the technical experts involved in the GLSP had to "learn" from the lay participants (and vice versa). As such, the GLSP illustrates how environmental consultancy science may become restructured to allow for a process of reciprocal learning in relation to the expert-lay relationship. This again points to the narrowing of the gap between those who make decisions about risks and those who are affected by these risks.

The de-monopolization of technical knowledge and the restructuring of science in the GLSP to allow for greater public involvement therefore gives credence to Lidskog's (1996: 49) claim that the contemporary treatment of environmental issues has re-opened the formerly closed construction of scientific knowledge and has led to its deconstruction and negotiation in a new social context, i.e., the public forum. This is seen for example in the way lay participants in the GLSP questioned the site-identification methods used by the technical consultants in relation to the soil data that were analysed in the process (i.e., traditionally, non-specialists in the lay public would not have access to such technical data and methods).

The opportunity for a wider range of values and concerns to enter into the treatment of the environmental risk issue in the GLSP reflects the need to consider the fact that modern environmental risks are far-reaching and persuasive. Such risks have an impact not only on the natural environment, but also on the economic, cultural, social and public health spheres of life. Such a realization is evident from the vast array of site-identification criteria developed by the lay members of the Guelph community. The pervasive impact of an environmental-risk issue, such as the possibility of leachate contamination of the community's drinking water in the GLSP, serves to illustrate a central feature of Beck's risk society thesis:

> The environmental problem is by no means a problem of the world surrounding us. It is a crisis of industrial society itself, deeply rooted in the foundations of its institutions and with considerable political resonance. Threats are produced industrially, externalized economically, individualized juridically, legitimized scientifically, and minimized politically (Beck, 1995a: 140).[8]

7. For a good discussion about environmental rationality and science, see Murphy 1994.
8. The multi-dimensional nature of environmental risks also allows for the flourishing of a new "ecopopulism" as documented by Szasz (1994) with regard to the transformation of the toxic waste movement into a movement for environmental justice in general.

For example, in Ontario the waste problem seems to have been passed on to the municipal polity. As we have seen in the case of the GLSP, the local polity attempted to "politically minimize" the problem by adopting a process in which the risk could be "scientifically legitimized."

From the above discussion it can be seen that the treatment of environmental risk in the GLSP was done in terms of the implicit reference to the "created" environment of science. However, another implicit definition was also involved, namely, the environment as a drinking water *resource*. Thus in the GLSP, the protection of the environment also meant the protection and maintenance of the *sustenance* base. What was inherently central to the adoption of this approach was the tacit emphasis on survival. Beck (1995a: 8) notes that ecological conflicts have a deep structure based on the violation of *survival norms* in which the "citizen's right to life and freedom from bodily harm" is threatened.[9] It was in confronting the issue of survival that lay participants in the GLSP emphasized that no risk to the community's drinking water would be tolerated, as indicated by the top priority assigned to groundwater protection. However, it was also realized by both the LSG and CASC that the risk of leachate generation could not be completely avoided (despite the claims of some members that Guelph's new wet/dry recycling facility would decrease the danger of leachate) and had to be dealt with by contingency planning.[10] However, in adopting such a seemingly pragmatic stance, the focus had tacitly switched from one based on prevention to one dealing with the permissible extent of contamination. Such a tendency once again points to a characteristic of the risk society:

> That it is permissible is no longer an issue on the basis of decree. The really obvious demand for non-poisoning is rejected as utopian. At the same time, the bit of poisoning being set down becomes normality. It disappears behind the acceptable values. Acceptable values make possible a permanent ration of collective standardized poisoning (Beck, 1992: 65).

It was with the above realization in mind that the following comment was made in the GLSP:

> In regard to leachate infiltrating the groundwater; are the engineered mitigation measures failsafe systems, or is there a recognition by LSG that some "acceptable" levels of leachate will enter the groundwater? (Letter from CASC Member and President of the Guelph Development Association, August 3, 1994).

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9. In line with this, van den Daele (1992: 326) asserts that previously it was difficult to place the environmental issue on the political agenda, but today the situation has changed because environmental issues are frequently being framed in terms of safety issues.
10. Several CASC meetings and workshops were devoted to the issue of contingency planning and monitoring technologies. In fact it was suggested (and accepted by the City) that a community monitoring agency be established to monitor the proposed landfill.

Some individuals, however, felt that "acceptable" levels of contamination may need to be assumed to realistically deal with the landfill problem. Thus one CASC member noted:

> Mitigation measures should not have to guarantee protection of the environment, but rather meet provincial-use guidelines. *Why not guarantee protection?* Can rural estate developments guarantee that on-site septic systems will not leach into groundwater, that road salt will not have adverse impacts on vegetation and groundwater?—No more so than a landfill can guarantee total environmental protection (Letter from CASC Member to CASC and LSG, July 14, 1994).

Although it may be said that a level of "standardized poisoning" remained and had to be dealt with, it should also be noted that the technical expert's monopoly in defining that standard was broken insofar as lay participants in the GLSP could ensure that the community standards of what was acceptable were not completely ignored (as exemplified by the introduction of community Minimum Acceptability Standards in the GLSP). In stressing that no risks should be tolerated may mean, however, that the Guelph waste problem will simply be transferred to another community.[11]

Finally, it should be noted that although lay members involved in the GLSP were able to participate in the technical matters related to environmental protection, the management of economic affairs still remained, to some extent, outside their purview. Nevertheless, toward the end of the process it became quite evident that the economic actors were well represented by their elected officials as it was City Council that rejected the LSG recommended site on the basis of negative economic impacts. As such, although accountability in the GLSP may have been sought in regard to the political and technical elites, the industrial elites and consumers escaped unscathed. For this reason, the case may be made that in concentrating on the siting of the proposed landfill, the more serious long-term environmental issue of how household and industrial waste should be reduced becomes displaced (such diversionary tactics are quite common in the treatment of environmental problems according to Schnaiberg and Gould, 1994). It should be pointed out, however, that social change often occurs incrementally. The opportunity to incorporate environmental concerns in the landfill siting process was at least indicative of a first step toward the possibility of a more substantial institutional eco-restructuring of other sectors in the future. Perhaps as more and more members of the risk society are forced to confront the pervasive impacts of environmental risks, increased institutional restructuring will no longer be considered as desirable, but rather as necessary.

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11. According to Szasz (1994), the realization of such a possibility has in fact transformed the "toxic waste" movement into a more encompassing and populist "environmental justice" movement in which the position of "Not-In-My-Backyard" has been extended to "Not-In-Anyone's Backyard." Such a perspective in effect vastly expands the notion of "backyard."

A Brief Evaluation of the Risk Society Perspective

The risk society theory casts a very broad net and seeks to analyse changes in large social institutions such as the polity and science (and perhaps does not pay sufficient attention to the economic institution, as discussed above). Problems are encountered in empirically testing such a broad theory because greater precision is needed in operationalizing theoretical concepts that are described only in a general fashion. Because of the overarching character of the theory, the number of concepts that need to be operationalized becomes unwieldy. As such, it is not possible to definitively test the risk society thesis on the basis of a limited case study such as a landfill selection process. Nevertheless, this study has meant to demonstrate at the very least that the risk-society theory does seem to direct the researcher to empirically relevant questions and issues, and provides some valuable insights for an analysis of a specific environmental issue such as leachate contamination.

Conclusion

Modern environmental risks have impacts that are: a) very complex in terms of causation; b) not limited by time, space or social class; c) not detectable by our physical senses; and d) are the result of human decisions. These characteristics of environmental risks introduce new challenges for the institutions that must deal with them. In this paper we have examined how the institution of science in the Guelph Landfill Search Process has responded to such challenges.

As we have seen in the Guelph Process, the fact that the risk of leachate contamination from a landfill is very pervasive meant that actors from a wide sector of society became politically mobilized. In order to accommodate such widespread public involvement, the City of Guelph developed a new channel in which lay individuals could participate in the technical matters related to the siting of their proposed landfill. Such a response to an environmental-risk issue had the effect of institutionalizing potential *interest groups* by transforming them into an *advisory group* (e.g., CASC), and, as Filyk and Cote (1992) observe, the advantage of the advisory group is its ability to directly communicate with the decision-makers (see also, Walsh et al., 1993: 25; Powell, 1985). The lay awareness of modern risks as pervasive and the realization that they are the result of human decisions leads to a demand for accountability to the public, and the formation of the advisory group addressed this need. However, this development leads to new problems, notably the issue of how to publicly deal with science in the risk society.

In achieving accountability in regard to *technical* decision making, the possibility arises for the incorporation of social standards of relevance. For example, environmental concerns in the GLSP may have been more

effectively incorporated in the decision-making processes. However, in the process of incorporating environmental concerns into technical decision making, these concerns were framed in terms of science. This is problematic in the risk society because of the *increased* lay awareness of the inherent uncertainties and limitations of science to deal with environmental risks. We have seen this to be the case in the GLSP in relation to the presence of competing hydrogeological claims and the public critique of the data and methods used in site identification and comparison. This ambivalent view of science is especially problematic for environmental groups because such groups frequently use technical knowledge in their claims-making activities, thereby implicitly conferring to science an authority role. Paradoxically, however, environmental activists realize that science and technology are often the cause of many environmental risks they oppose, thus de-legitmizing its position of authority (Yearley, 1992b). In any case, the de-monopolization of technical knowledge and the increased lay access to technical decision-making represent forms of institutional eco-restructuring of science in the Guelph Landfill Search Process. The fact that many lay individuals continued to participate in the Guelph Process indicates that many still valued the role of science in at least trying to deal with the environmental-risk issue. As a consequence of appreciating the value of science in this respect, it was publicly realized that although science could not offer any guarantees with regard to environmental risks, it ought not be rejected altogether either.

In conclusion, the Guelph Landfill Search Process thus clearly illustrates how lay environmental concerns are beginning to be institutionalized within environmental impact science. Further, such a process of institutionalization was prompted by the very character of modern environmental risks and the conditions of the risk society.

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