

Cultural Factors in Risk Perception: Observations from Interactions with Aboriginal Communities

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Abstract A nuclear facility is arguably the most difficult industrial facility to site, especially with regard to public acceptance. Public resistance to such facilities is a complex blend of emotion-laden imagery coupled with a risk perception process that is diametrically opposed to the scientific process by which scientists define nuclear risks. While much of the literature that deals with risk perception and public acceptance considers the problem (and any offered solutions) for a single societal standpoint, the issue becomes more complex when the community is made up of many different cultures—especially when the set of cultures includes aboriginal people (“Aboriginal,” for the purposes of this paper, is meant to represent all First People, regardless of what they or their governments call them, including Native Americans and Eskimos (US), First Nations and Aboriginal People (Canada), the Maoris of New Zealand, the Aborigines of the Australian Outback and any other culture that predates Western discovery. No disrespect is intended by this simplification.) for whom there is a traditional and spiritual relationship with the land. The level of success that owners have when attempting to site a nuclear facility appears to be correlated with the homogeneity of the host community population. This paper offers insights for successful public outreach and acceptance when dealing with more diverse local cultures, based on lessons learned, in part, from the efforts of Ontario Power Generation’s permit to construct and operate a Deep Geologic Repository (DGR) for low- and intermediate-level waste at the Bruce Nuclear Site in the Municipality of Kincardine, Ontario, Canada.

Keywords Risk perception · Equity · Stigma · Social amplification of risk · Cultural differences · Public acceptance

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1 Stigma and the Social Amplification of Risk

Goffman [1] introduced the term “stigma” as the result of a process by which people that do not conform to society’s norms become rejected by society. Stigma is judgmental; it does not come from within; those who are not stigmatized impose it upon those that are. Drawing heavily upon testimonials and personal accounts, Goffman defined three pathways to stigmatization of the individual: character, physicality, and group identity; each of which provide signals as to whether or not an individual is “acceptable” as a person and as a member of their community. While he did not work specifically with the stigmatization of things, nor did he coin the term itself, his work introduced the process of risk perception, which, over the next twenty years would be applied to places, products, and technologies.

Easterling [2] defines stigma as “the extreme case of either the risk avoidance or negative-imagery process.” Recent perception-based valuation studies reveal individuals do not make risk-based value judgments by relying on the conclusions of science, the actual probabilities assigned to outcomes, or the experience of experts. Instead, risk-based valuation is a highly internalized assessment process based on intuition, emotion, and the superficial assimilation of a large amount of technical and potentially erroneous information in a short period of time (Flynn et al. [3]). And because the individual’s risk-based assessment is emotion-laden and emotion-driven, there is no dilution of potential impacts based upon some scientific assessment of the risk being measured in terms of “one in a million” or “ten to the minus five” probability of occurrence. For the layperson, the probability of the triggering event’s occurrence is “one hundred percent.”

A basic tenet of modern economics is the idea that people choose the thing that will give them the most satisfaction from among all of their possible choices. For choices with the possibility of more than one outcome, people choose based upon which alternative has the greatest “expected value,” the probability weighted net benefit of each potential outcome. For instance, if a person could buy a lottery ticket that paid out a million dollars but had a one in a million chance of being the winning ticket, then the expected value of that ticket would be one million dollars times one-millionth, or one dollar. If the ticket cost more than a dollar, then the most reasonable choice would be to not purchase it. But if the ticket cost less than a dollar or paid out more than a million, that ticket would have an expected value that would be greater than the cost of the ticket and the rational individual should purchase the ticket.

For the lottery ticket example, there is perfect knowledge—the player has all of the information they need to make an informed choice: there is the known cost of the ticket (one dollar) and the known benefit (one million dollars), and the probability of winning (one in a million). For more complex and technologically advanced choices when the costs and benefits are unknown or unknowable,¹ the

¹“Unknowable” has two aspects here. Either the information is literally unknowable, such as the number of grains of sand on the beach; or it is outside the technical expertise of the individual, such as dispersion of radiological materials following an accident.

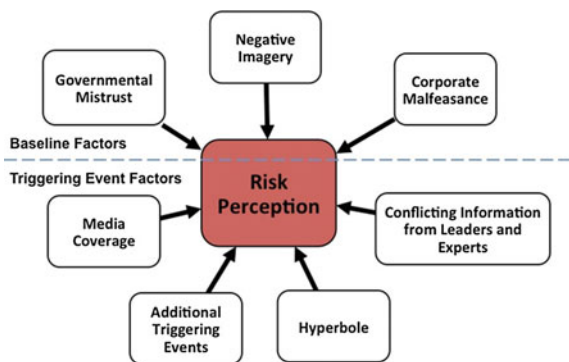
individual’s comprehension of each choice breaks down, and the assessment of cost and benefits becomes more subjective. This is where the breeding ground for stigmatization begins: with the breakdown of the individual’s process for evaluating uncertainty.

When assessing difficult issues, policymakers use complex scientific and mathematical models to weight the expected benefits and costs of each choice. In essence, policymakers apply the same expected value assessment process used by the lottery player, only their information base is enhanced by a greater understanding of risk. For example, when evaluating the need for retrofitting an existing nuclear reactor to include a design improvement, regulators in the United States use an analytical tool called probabilistic safety analyses (PSA) which compares the cost of the retrofit to the probability weighted value of the avoided damage that change would produce.

For highly technical choices, this impartial, arm’s length approach of the scientific method is too complex for the layperson. Instead, the layperson’s process involves social norms, emotional response, the unscientific assessment of costs and outcomes, and, most importantly, reliance upon the authority of others. This emotion-laden valuation process offers abundant opportunity for the assimilation of the rhetoric, exaggeration, and fear that skews risk perceptions. Kasperson et al. [4] calls this “the social amplification of risk.” As Kasperson explained, given a lack of personal knowledge on a subject “secondary accounts or media information will often be principal sources of image information. Once perceptions... are formed, they may become resistant to new or ‘corrective’ information,” even if the source of the information is not an expert on the subject (Fig. 1).

Kasperson observed that society’s assessment of risk shares a strong link with the community’s psychological and social processes; and that this linkage can intensify public responses through the transfer of information about the risk. Kasperson described this process as a feedback loop whereby a risk event (triggering event) causes authorities, scientists, and officials to report the salient facts about that event (the transfer of information). This reporting is then repeated, especially by the media and interest groups, in hyperbole-laden terms that elicit

Fig. 1 The Dynamics of the social amplification of risk



emotional and behavioral responses and exaggerates the perception of risk (the response mechanism). This process results in additional rounds of reporting, each further amplifying the perception of risk (Kasperson et al. [5]).

This feedback loop is especially important for an individual's perception of what Gregory et al. [6] and Rozin [7] identified as "dread consequences," the process of ascribing deeply personal valuations to an unknowable risk consequence. Over time, repeated exposure to such amplification tends to reinforce society's distorted perception of risks. Furthermore, as Slovic [8] observed, there is an asymmetric aspect to the trust an individual has, in that trust is much easier to lose than it is to gain.

When seeking acceptance of a hosting community, owners should understand that the proposed project—no matter what kind of project—is only a placeholder for all of the negative imagery and stigma that has grown from the history of other, similar facilities. Once a triggering event takes place, for the layperson, that triggering event at other locations becomes inevitable. To the general public this is a reasonable conclusion because the rules of entropy tell us that, eventually, the failure rate of anything is one hundred percent. In other words, owners are not asking the public to accept the new Sanmen Unit 1 as a part of their community; they are asking them to accept Fukushima Units 1, 2, and 3. Rather than the highly improbable occurrence of a triggering event (typically an accident, such as a Loss of Coolant Accident—LOCA), the imagined consequences of the event begin the distortion of risk perceptions.

Mitigating the stigma associated with a nuclear facility is the challenge that faces those who seek to obtain public acceptance. To that end, owners will expend great amounts of effort to explain to the public that the safety of the proposed facility lies, in part, on the extremely low probability of an accident. The explanations typically involve a measured, rational, and scientific approach to the issue in a language that is familiar and comfortable to the scientifically trained nuclear engineer. With a large part of the general population not well versed in technical jargon, such statements are meaningless. Instead of technical jargon, those seeking public acceptance should understand how stigma develops and what sustains it.

- Stigma impacts from a triggering event are not localized; they can be imposed on numerous venues thousands of kilometers away. Consider the global response to Fukushima as an example. Because of the perceived increase in danger from nuclear power plants, much of Europe closed or announced closures to their nuclear fleets. Germany accelerated plans to completely close its nuclear power reactors by 2022. Italy held a national referendum in which 94 % of the population voted against building new nuclear power plants. France announced plans to reduce nuclear usage by one third.
- The more severe the triggering event, the longer the stigma will last. Small incidents such as a low-level waste spill may fuel the fires of nuclear opposition, but those flames will die quickly because the unknown consequences become known rather quickly and the event has a limited timeline between beginning and resolution. However, a larger accident will produce a much larger and much longer lasting sense of dread in the general public. For example, there was little

long-lasting stigma from Three Mile Island (TMI) because it was contained quickly, but for Fukushima, the effects continue to linger because the accident was much more severe.

- The greater the media coverage of the triggering event, the longer the stigma will last. People tend to trust news personalities because they are familiar representatives of an organization that serves a “sacred trust.” Even the dissemination of information by highly respected journalists with the best of intentions can severely damage an industry. Johnson [9] explains the process as “... newspapers and other news media attempt to translate technical information into forms that readers can understand. This process involves substantial subjective interpretation, especially when messages from the regulatory agency are insensitive to the information demands of ordinary people... The result is often that press reports appear as garbled and distorted accounts of the agency’s message [about risk]...” Kasperon et al. [5] discussed how information dissemination stimulates the social amplification process through dramatic headlines, exaggerated predictions, and evocative video footage. The more a story is repeated in the news, and the greater the number of news sources that carry the story, the more the public will focus its attention on the issue. Since news broadcasting is a competitive industry audiences must be won, and the result is exaggeration and sensationalization of the most fear inducing elements (“If it bleeds, it leads.”).
- Conflicting information from authorities exacerbate the stigmatization effect. Disputes over factual information and debates by experts over important issues heighten the public’s level of stress and lead to the development of increasingly negative imagery. Community leaders often call for calm and downplay the potential consequences of an accident when speaking to the public. Their words are often in direct contradiction to the actions people see in news footage and later, if leaders are forced to revise their earlier statements of danger when conditions are found to be worse than originally estimated, the public perceives these actions as evidence of incompetence.
- Mismanagement and collusion between officials exacerbate the development of stigma. “Under the risk-avoidance theory, the potential for economic losses increases if the repository is plagued by mishaps or mismanagement. However, even in the absence of serious incidents, the public may view the risk as sufficiently high, particularly if repository-related concerns are highlighted by the media or interest groups” (Jenkins-Smith [10]). Even unsubstantiated claims of malfeasance, collusion, or secretiveness by industry or the government could increase the severity of a stigma. Any inherent lack of trust the public may have for the government in charge of the project or the corporate entity that operates it adds to the distrust individuals have for “Big Government” or “Big Business.”
- The longer the stigma lasts, the greater the chance that some other triggering event will take place, resetting the mitigation clock. New incidents act as justifications for the strong negative feelings people have. During the period when the stigma is strongest, any additional triggering event will only reinforce the

negative perceptions of the public, lengthening its duration and strengthening its resistance to more reasoned argument.

- Stigmatization will decline over time but cannot end so long as the source of the perception is still present. Three Mile Island was an accident that dissipated quickly because the containment was never breached and any visual evidence of the meltdown was hidden from public view. In addition, little if any radiation made it out of the TMI facility and there was little opportunity for anti-nuclear activists to find external evidence of continued danger. Fukushima, on the other hand, continues to be a news topic because it is a highly visible scar on the coastline and because of the large amounts of highly radioactive material released into the ocean.

Stigma arises from a sense of helplessness. One feels a standard of what is right and natural has been violated or overturned because of the abnormal nature of the triggering event (e.g., crude oil on pristine beaches and the destruction of valued wildlife) or the discrediting nature of the consequences (e.g., innocent people are injured or killed). Even when the observer is thousands of miles away the sense of helplessness can begin the stigma process, especially for nuclear issues. This is because the layperson sees no boundary to the effects of the event because any limits to their magnitude or persistence over time are not well known.

Stigma can be especially strong for contamination-based accidents because the idea of something invisible invading or penetrating the human body evokes intimate and repulsive imagery, what Rozin [7] deemed “invasive stigma.” Rozin identified several features of invasive stigma:

- Physical contact: Invasive stigma depends heavily on physical contact with the contaminated item, which allows the individual to actively ingest the contaminant.
- Permanence: Once contaminated, individuals see an object as being contaminated indefinitely (once in contact, always in contact).
- No threshold: The contaminant is dose insensitive. As widely attributed to Schopenhauer: “A teaspoon of sewage will spoil a barrel of wine, but a teaspoon of wine will do nothing for a barrel of sewage.” The layperson sees even the tiniest quantity or the briefest period of contact is extremely potent. Furthermore, the marginal contribution of repeated contact increases the negativity associated with the item, but only minimally; because that first contact carried with it most of the negative imagery.
- Unexpectedness: The origin of the invasion is unknown, in the sense that the process is not well understood but believed universally to be present and dreadful. Because the individual cannot know how or where the contamination happens, there is a concomitant imagery of helplessness and defenselessness. This sense of helplessness can be especially strong for people fearing nuclear contamination because unlike the poisonings that occurred with the Bhopal accident in India, it often takes many years for radiation-based cancers to be detected.

Rozin makes the point that if the stigma has a moral aspect it is much more difficult to overcome. When laypersons perceive impacts to be inequitably distributed across groups (e.g., children or pregnant women are affected disproportionately) or geographic areas (e.g., one city bears the risks of hazardous waste storage for an entire state), the inequality can evoke feelings of unfairness and discrimination. This can be seen by how the media covers events that can elicit a stigma reaction, as many health issues are framed in the context of societal issues—children’s health, protection of the old and pregnant women, etc. The calm voice of authority and well-reasoned assurances from respected experts are often not sufficient to assuage such fears.

Stigmatization does not always develop because of the nature of the technology, but because the complexity of the technology involved provides a target rich environment that exacerbates existing perceptions of risk. Freudenberg [11] observed people interact with technological risk in two ways, through their assessment of potential risks and as the operators of the risky technology. Not only does the individual perform a personal assessment of risks according to Kasperson’s [5] subjective imagery-based process, that individual assumes there will be some degree of operational risk associated with the technology—human error.

An excellent example of this operational aspect of technological risk perception can be found in the conclusions of US President Carter’s Commission on the Accident at Three Mile Island (TMI), which originally suspected the accident was due to a hardware problem and eventually concluded that the overall problem was human error. Even though the operators at TMI were among the most highly trained and experienced nuclear power plant operators in the world, the confluence of a number of individually minor problems, combined with the stress of an emergency, led to operator error. Freudenberg offers an extensive list of opportunities for human error to insinuate themselves into highly technological processes, including such image-rich examples as “the atrophy of vigilance” (Freudenberg [11], p. 19).

Most of the guidance available for those seeking public acceptance of a nuclear facility speaks to forming consensus groups. In its guidance document for public interaction, “Effective Risk Communication, The Nuclear Regulatory Commission’s Guidelines for External Risk Communication,” the NRC defines risk as one of two things: probability times consequences (which it describes as resting on “sound scientific analysis), and hazard plus outrage (the probability that something bad will happen to people combined with the aspects of the situation that upset them) (NRC 2004). It is the difference that causes problems and the only way to solve that problem is through “meaningful dialogue” after establishing a “shared understanding.” The guidance goes on to describe the public as a single entity that needs to be addressed: “stakeholders,” and presents a flowchart for implementing an effective risk communication plan.

The problem with this road map is that it does not clarify that there may be many different stakeholder groups, each of which has its own set of values and concerns. And, in many cases—especially in communities where there are aboriginal people coexisting alongside a Western or modern technological culture. Native American tribes are probably the most familiar groups of aboriginal people in this situation,

but the Aborigines of the Australian Outback and many of the tribal communities living on the Pacific Islands would also qualify. The remainder of this paper will provide a real life example of community acceptance in a diverse community.

2 Risk Perception and Equity

Very few communities are made up of a single homogeneous group that has only one opinion on all topics. Perceptions vary across all demographic cohorts. Jenkins-Smith [10] provides strong support for the following observations with respect to the demographic differentiation of nuclear energy perceptions

- Men are more supportive than women
- Minorities are less supportive than Whites
- Education and income increases support
- As age increases, support increases
- The closer one lives to the site or transportation routes, the greater the support
- Greater approval of government correlated with a greater support for the facility
- Conservatives were more supportive of nuclear projects than liberals.

Jenkins-Smith's observation that "the closer one lives to the site or transportation routes, the greater the support" seems counterintuitive. If the dread of contamination drives risk perception, then wouldn't the closest people—those most at risk of exposure—display the greatest level of aversion? The literature of risk perception explains this counterintuitive result as a phenomenon called "the halo effect." According to Metz [12], a halo effect in the context of a geologic repository for nuclear waste is a combination of

- Desensitization: Continuous contact with the risk source over a long period of time attenuates any adverse imagery the person may have initially held. A halo effect "can be attributed to several factors, such as a person's familiarity with the facility over time, the fact that they volunteered to locate there, their heightened safety training, and the fact that they have more information engendered through their or their neighbors' employment at the facility" (Bassett and Hemphill [13]).
- Refutation: Gregory et al. [14] explains the halo effect as a consequence of experience: "Technological stigma should be seen as a rational social response to the multiple influences that produce it and therefore as subject to a variety of rational solutions." In other words, negative imagery is a dynamic phenomenon subject to continuous revision. Over time an individual's initial negative imagery of the consequences of close proximity to a risk source can be refuted by the lack of such negative consequences.
- Utility maximization: Proximity to a risk source like a nuclear power plant can provide significant public benefits through lower property taxes, employment, and public services and infrastructure improvements. As these amenities become

more evident, negative imagery becomes counterbalanced as any perceived risk, negative imagery, or stigma that may exist is overwhelmed by a desire to reside close to the workplace or other local economic or environmental benefits.

Hine et al. [15] expanded this list to differentiation between aboriginal and non-aboriginal people in Canada with regard to the siting of a proposed nuclear waste facility. He observed aboriginals resist siting a nuclear waste facility near their historic lands to a much greater degree than non-aboriginals. A significant portion of the lack of trust was founded in the inequitable distribution of costs and benefits from such projects. In most cases, the primary social costs are borne by the local aboriginal people while the benefits of the project are spread much farther, sometimes as broadly as nationwide.

From a survey of public acceptance of a proposed nuclear waste repository performed in three towns and one First Nation reservation in the Province of Saskatchewan, Canada Hine found support from Aboriginal people for the proposed nuclear waste repository to be low. "Close to three-quarters of the sample (73 %) indicated they would vote against the repository in a referendum, whereas only 10 % indicated that they would vote in favor." The Hine study also found "respondents consistently rated benefits as less important and less likely to occur than costs. For importance ratings, the highest rated benefit (improved local economy) was rated lower than the lowest rated cost (sabotage)."

The inequity characteristic of siting is not limited to native cultures only, but exists across most racial and cultural minority groups. Pulido [16] determined structural forces, such as racism, account for the collocation of low status communities and technological hazards and Hamilton [17] found the expansion of commercial hazardous waste facilities in the United States is closely associated with communities composed of racial minorities. Minority populations tend to self identify as victims of intentional discrimination and often have the empirical evidence to support it. Consequently, when siting a nuclear facility, it may be unintentionally coincidental that the closest communities are predominantly minority or low income in nature, but that is not how the community sees it.

The inequity aspect of nuclear siting is especially important to consider when seeking public acceptance. Economics and siting regulations guide those seeking to build industrial projects toward areas that are not heavily populated, have large amounts of inexpensive land, and where the environmental impacts will be lowest. Clearly, large industrial facilities cannot be located in wealthy neighborhoods simply because the value of the land is too high, and locating near transportation corridors such as major freeways and rail lines typically involves locating near low-income communities. The problem is sufficiently large that in the United States, major Federal actions must undertake an Environmental Justice assessment of the minority and low-income populations that could be affected by the proposed action.

3 Seeing the World Through Someone Else's Glasses

On December 2, 2005, Ontario Power Generation (OPG) petitioned the Canadian Nuclear Safety Commission (CNSC) for a permit to construct and operate a Deep Geologic Repository (DGR) approximately 1 km from the shore of Lake Huron, at the Bruce Nuclear Site in the Municipality of Kincardine, Ontario. Bruce Nuclear Generating Station is the largest nuclear generating station in the world with eight operating reactors. According to the application, the proposed DGR would receive only low- and intermediate-level radioactive waste, including waste produced and stored on the Bruce Nuclear site and waste produced at other OPG—owned generating stations in Ontario.

The land occupied by the Bruce Nuclear Site was land once owned by the Anishinaubae People, most commonly known in the United States and Canada as Ojibway or Chippewas. The land upon which the Bruce Nuclear Site stands was ceded to England in 1836. While the land was no longer theirs exclusively, the Chippewas retained their hunting and fishing rights to the lands and waters of Bruce Peninsula. The Saugeen Ojibway Nation (SON) is comprised of the two Ojibway bands that live on the Bruce Peninsula: the Chippewas of Saugeen First Nation Reserve #29 and the Chippewas of Nawash Unceded First Nation Reserve #27 on the eastern shore of the Bruce Peninsula on Georgian Bay. The Mission Statement of the SON clearly speaks to the protection of their rights: “To provide the infrastructure and expertise for environmental matters that affect the interests of the Saugeen Ojibway Nations and, in doing so, assist the Chiefs and Councils of the Saugeen Ojibway Nations to assert First Nation jurisdiction over the environment of the traditional territories.”

Canadian constitutional law requires that when an action may affect Aboriginal and treaty rights, then the affected people should be consulted. Because Canada approved the construction and operation of the Bruce Nuclear Site without consultation, the SON have been placed in an adversarial relationship with OPG since the early 1970s, when the Bruce Nuclear Site began construction of its first CANDU unit. When OPG performed its Environmental Assessment for the proposed DGR, they established a Regional Study Area (RSA) within which OPG expected most, if not all, of the socioeconomic and environmental impacts of the DGR would be experienced.

The Chippewa of the Saugeen Reserve shares its southern border with the northern boundary of the RSA. Whether it was done intentionally or unintentionally, omission of the Bruce Peninsula north of the Bruce Nuclear Site excluded for consideration the impacts such a DGR may have on the Saugeen Ojibway Nation. As noted earlier, one of the factors that intensifies risk perceptions is a lack of trust. Aboriginal people have a long history of mistreatment and underhanded dealings with governmental agencies, and this condition was not mitigated by the exclusion of the SON from the study area. The perception was, as stated in the SON's criticism of the DGR Environmental Assessment, that OPG had “hard wired” the conclusions of the analysis in favor of the proponent, as evidenced by the fact that

OPG was heavily interrelated with the Canadian Nuclear Safety Commission (CNSC), who was the final decision-maker regarding the siting of the DGR. In that context, SON's objections to activities at the Bruce Nuclear Site are understandable.

Contemporary equity considers the condition where those individuals who are expected to absorb the costs of a project are not the same individuals who are granted its benefits. With the DGR, the inference is straight-forward: The SON and other residents of the Bruce Peninsula were expected to bear the full extent of the costs of the proposed DGR, including the disruptions of construction and decommissioning, the economic impacts of the presence of a nuclear waste facility, and the consequences of any sort of accident that might occur. However, the benefits of the DGR derive from the electricity that millions of Canadians enjoy—as well as the sense of safety the rest of Canada would get from not having to store radioactive waste in their own back yards. And, long after there are no more benefits from the Ontario power plants that will fill the DGR, those costs will continue for the people of the Bruce Peninsula. This is especially important to the Anishinaubae, for whom the land has been their ancestral home, diminished in great part by treaties and negotiation, but still a part of their spiritual identity.

Intertemporal equity is tied to the longevity of the nuclear waste problem. The US National Academy of Sciences [18] stated: “Many risk decisions may impose risks on future generations that require a different kind of consideration from risks to people living today.” Typically, the process for evaluating the effects of a risky decision on other generations involves a high degree of solipsism—the attribution of one's own value structure on a different cultural group. This is the underlying problem with much of modern decision-making, especially with intercultural assessments, but the added dimension of generational differences increases the degree of difficulty exponentially. A Western-based mindset cannot be accurately attributed to that of a non-Western culture many generations into the future.

The stigmatization of place is a major concern for the SON because the proposed site is located on a major tourist venue due to its pristine beaches and clean waters. Eco-tourists, by definition, tend to be the least philosophically receptive to environmental degradation, one of the most emotionally charged sources of stigma. Given that negative imagery would be imposed on the perceptions of precisely those individuals for whom ecological valuation is a high priority—eco-tourist visitors to the Bruce Peninsula—the potential impacts are even more profound.

The Bruce Peninsula hosts tourist-attracting events year round, with almost one hundred special events and festivals between early May and early October, including vendor markets, theatrical performances, fireworks displays, and seasonal festivals. There are two National Parks, eight Ontario Parks and four Federation of Ontario Naturalists Parks located on the Bruce Peninsula, as well as thirteen lighthouses. In 2010 there were almost 1.5 million person visits² to Bruce County,

²Person visits are defined as any individual who visits the park for purposes of heritage appreciation. Persons reentering on the same day and persons staying overnight do not constitute new person visits. If a person leaves the park and returns on a subsequent day, this would constitute a new person visit (SOM Inc. 2008).

about 93 % from Ontario, another 1.3 % from elsewhere in Canada. Foreign visitors accounted for 5.6 % of all visitors, 4.7 % coming from the United States and slightly less than one percent coming from overseas. All tourists spent a total of C\$ 169 million in the county, C\$ 47 million while on vacation in Bruce County. The average Canadian overnight tourist spent 2.8 days in Bruce County, and foreign overnight visitors spent 3.6 days (US) and 5.3 days (Overseas), which one would expect. When tourists come to the Bruce Peninsula, they stay as guests and eat the food of the SON.

Today, the Chippewas of Saugeen First Nation have a profitable private cottage leasing industry, with over 1,100 cottages available either on the shore or within less than a block of the shore along Lake Huron. Rental rates range between C\$ 750 per week and C\$ 1,250 per week, depending on amenities. The industry generates between C\$ 20 and C\$ 40 million in private incomes each year. The Chippewas of Nawash Unceded First Nation has about 500 cottages for lease on the opposite side of the Bruce Peninsula, along the shores of the Georgian Bay. The Nawash cottages rent for between \$650 and \$1,000 per week, depending on amenities.

The SON also operates a commercial fishing enterprise on the waters of Lake Huron directly adjacent to the proposed DGR (and the eight existing operating reactors). Rosin [7] studied the stigma associated with foods and found a high degree of public aversion to foods that have the potential for contamination. Were there to be an accident (or even the perception of an accident) associated with the Bruce Nuclear Site, the general public could view local foodstuffs—especially those harvested from local waters immediately adjacent to the site—as having been rendered harmful by radiological contamination. The proximity of the proposed DGR to the fishing waters of the SON is extremely problematic. The hospitality industry at the level undertaken by the First Nations does not operate with a large profit margin. To compete against literally a thousand almost perfect substitutes for their product (whitefish not from near the DGR, a beachfront accommodation with amenities), prices necessarily cover costs but with little if anything left over to manage unexpected repairs or economic downturns. If the flow of visitors declines, cottage owners are left with expenses but no revenue flow to cover them.

Equally important from the point of view of the SON fishery, the most powerful sources of food related stigma are those adverse effects generated by eating contaminated items. If media hype and hyperbole can be seen as coming from an authoritative source, the public may rely upon that media information, which would exacerbate the development of a stigma without merit. An extreme example of how negative images of foods can lead to stigmatization—and irrational behavior—can be seen in the case study of Zambia in 2002. While over 2 million people suffered on the brink of starvation following a prolonged drought, President Levy Mwanawasa decided not to accept a donation of 17,000 tonnes of U.S. and Canadian food because of the fear that genetically modified (GM) foods could enter the African food chain. The misinformation started with a study at Cornell University that claimed pollen from a GM corn plant caused cancer in Monarch butterfly larvae. Scientists and regulatory agencies around the world rejected the study's conclusions but not before the cancer claims had been embraced by

environmental activist groups. These groups exploited the study via the Internet to discredit the use of GM food, which ultimately led to Zambia's rejection of humanitarian aid (BBC News 2002 [19]). Zambian President Mwanawasa defended his decision by stating: "There's no justification for feeding people poison."

There are many fish in the market and they are all good substitutes for one another. If the price of one fish goes up or its quality goes down, consumers do not hesitate to change their choice to another fish. If the hospitality industry's market is characterized by no margin and limitless substitutes, then the commercial fishing industry must be its grocery store analog. Fishing tugs operate with little room for financial error and the hint of contamination will drive many consumers away, forcing SON fishermen out of the market. Brand loyalty is not a trump card for negative food imagery. Even highly prized delicacies have not been able to stand up to the invasive stigma of contamination.³ We cannot expect better from a simple staple such as whitefish.

The cottage leasing industry generates over C\$ 60 million per year to the SON (divided about two-to-one between the Saugeen and the Nawash), and the fishery adds about half that value again. These two enterprises exemplify the self-sufficiency of the Anishinaubae people and represent their best strategy for breaking the cycle of dependency to the Crown. The future prosperity of the SON is a function of its ability to establish long-term profitable enterprises that offer a reliable cash flow upon which further economic growth can be based. The presence of a nuclear waste storage facility on the Bruce Peninsula threatens that future.

The problem with the SON's opposition to the DGR (as well as all of the earlier Bruce Nuclear Site actions) was that there was a significant level of resistance from OPG to the message that the SON repeated at each meeting: The SON wanted a decision-making seat at the table, where they could have input into the entire process of the DGR, from planning through implementation. The Anishinaubae teach that each physical place contains an intricate community of living beings with a legal personality whose agency must be respected. "The world for us is storied. It has all of these voices that speak to us because we hear in those places what our grandfathers told us" (Borrows [20]). Unlike Western culture, the Anishinaubae believe all things have a Manitou (roughly and imperfectly translated as "spirit") and that each Manitou must be actively involved in any decision or activity that potentially affects them and that their decisions must be respected. In other words—as OPG eventually began to realize over time—the SON's main concern was not that there could be a DGR on their historic land, but that the consultation process needed to include the SON to ensure the land itself was okay with the DGR.

The Anishinaubae are a people with a long (perhaps 25,000 year) history of close interdependency with the land. To some extent, a Western approach to making a living is anathema to their way of thinking. To the Anishinaubae, the land provides, but it does not give up its bounty readily. To receive from the land, one

³For example, <http://www.nytimes.com/1987/12/02/garden/swiss-halt-production-of-tainted-cheese.html> "Swiss Halt Production of Tainted Cheese," New York Times, December 2, 1987.

must go to great effort, and even then, the land will only offer up what the person deserves—not necessarily what they need to survive. “To keep from starving before winter was over... men and women labored mightily throughout the summer and fall to store enough food to last them until spring. Work was the chief ethic.” (Johnston [21])

The burgeoning fishery of the SON is as important to the survival of their culture as monastic ritual and simplicity is to the monk. Each serves as a vehicle by which the individual grows closer to their God. Through their fishery the SON see a path out of the historic dependency that had been imposed upon Aboriginal people since the Indian Act of 1876. How would the stigma of the DGR affect the commercial fisheries industry near Saugeen Shores? The reasonable layperson would assume “the solution to pollution is dilution,” and that the potential for contamination from radiation would diminish with distance. Consequently, it is reasonable to infer that the most “dangerous” fish to consume would be those that live closest to the proposed site and the greatest stigma concerning contaminated fish would be imposed on those fish in closest proximity to the site. By treaty, the SON has exclusive commercial fishing waters that border the shoreline next to the proposed DGR, which means this stigma effect would be felt exclusively by the SON.

The turning point in the interactions between OPG, the CNSC, and the SON came in two parts. First, in 2011, the Canadian Ministry of Natural Resources (MNR) settled a long held dispute between sports fishermen and the SON about fishing rights. In a public announcement from in front of the SON offices, the MNR announced a Framework Agreement that reaffirmed the SON’s rights under Crown treaties and litigations and created a “constructive, ongoing, and harmonious, long-term relationship between SON and MNR by reaching agreements regarding the fishery and waters [historically SON’s by treaty].” The Framework Agreement provided up to \$C 850,000 over a 5-year term in a collaborative effort to make the SON fishery a successful enterprise. This marked the beginning of an entirely new relationship between the Crown and Canada’s Aboriginal people, one based on cooperation and mutual respect rather than one of broken promises and aloof authority.

The second landmark was when OPG, after decades of negotiating with the SON on environmental issues, began to understand the issues from the Anishinaubae point of view. The problem was as much about the fish as it was about the land.

Social anthropologists have coined the term “traditional ecological knowledge” (TEK) for the process by which North American Indian people apply traditional practices and experiences. It is “community-specific, place-based (i.e., geographically specific) and accumulates over time by shared experiential knowledge across generations. Subsistence hunting and fishing are a practical way for a community member to express his connection to the TEK. The TEK identifies what the person must do to proclaim their membership in the community under the formal processes that describe the traditional ways for harvesting fish, game, and plant life.

Every Native American culture has legends of starvation because their lives were so heavily based on subsistence. How food is harvested is just as important to the traditional identity of a Native American as its consumption. Food is such an important aspect of a Tribe's survival that it is probably the most honored and cherished gift that can be given. In pow-wows and potlatches across North America, tribal leaders honor visitors with the gift of food. For the Saugeen Ojibway Nation, that food is whitefish, a delicacy. Donatuto [22] captured the essence of the stigmatization problem in the title of her dissertation: "When Seafood Feeds the Spirit Yet Poisons the Body." In India, food prepared by someone of a lower cast triggers disgust and physical nausea. Halal (permitted, kosher) foods can be tainted by even very small quantities of forbidden items. If the SON offered a gift of whitefish that the guest perceived to be tainted in some manner by the DGR—whether real or imagined—would the visitor refuse the gift and embarrass the SON or reluctantly accept it?

OPG seems to have listened and finally learned it was not an anti-nuclear argument the SON was making, nor was it an issue of "us versus them." Instead, OPG realized it was the spiritual/cultural aspect of the issue that worried the SON. The DGR threatened the SON economically, as stigmatization of its land and its fish could put a halt to their path to prosperity, and it was a cultural stigma in that adverse risk perceptions could force the SON to abandon their historic practices that had sustained them for millennia. In 2014, Ontario Power Generation made the following statement in its closing remarks before the CNSC's Joint Review Panel for the DGR, recognizing not only the SON's willingness to help, but also its cultural need for inclusion in the decision-making process:

In recognition of the importance of the SON engagement, OPG has indicated that it will not proceed with construction of the DGR, should a licence be issued, without the support of the SON community. As the Chief indicated in his remarks, the SON recognizes the existence of the wastes and are prepared to participate in developing a solution. The SON are committed to working in good faith, as is OPG, toward an understanding of how the project may affect the SON's way of life and how the project can come to be accepted by the SON.

The SON identified as an issue of particular concern to their community the question of whether the DGR poses a risk to the whitefish population and its habitat in Lake Huron. OPG recognizes the importance and cultural significance of whitefish to the SON. The SON has successfully defended in court its constitutionally protected aboriginal right to fish. SON is working collaboratively with the Ontario Ministry of Natural Resources to ensure proper management of the whitefish resource. (JRP [23])

On May 6, the Joint Review Panel, issued the Environmental Assessment Report for the DGR, recommending approval. As of November 2015, Canada's Minister of the Environment and Climate Change had not made a decision on the DGR. The SON remains committed to working in good faith with OPG and the Canadian government to work toward the eventual completion of the DGR.

4 Summary and Conclusions

Public acceptance is a function of the public perception of risk, which is a highly emotional process. The public is not well versed in the science of nuclear engineering and embedded fears of catastrophic accidents drive much of the layperson's perception of nuclear issues. Public perceptions are formed by relying on the media and the Internet, who appear to speak with a level of authority and trust, even if their level of expertise is no more than that of the public. Much of the literature recognizes these impediments to public acceptance. Governments and industry have expended valuable resources in developing guidance meant to facilitate the acceptance process and ensure the proposed project meets as little public resistance as possible.

The public acceptance process, according to many guides, is based on providing risk information to the public in a meaningful manner. This is based on the belief that once the risks have been explained sufficiently, the stigmatization process will abate and open the way to full public acceptance. In other words, the process for achieving public acceptance is simply a matter of "good communication" to a lay audience. These guides are off the mark in three important ways. First, they reflect the attitude of those performing the outreach. The process is aloof with a tone of academic superiority that puts the proponent at arm's length from the targeted audience. Second, to make matters worse, there is a "one size fits all" oversimplification to the guides, where instructions suggest there is only one public, so there is only the need for one approach to communicating with it. This overlooks the diversity of age, gender, race, and any number of other factors that can differentiate how people define risk. Finally, communicating risk to achieve public acceptance seems to be a short-term issue: you plan, practice, and then, when you finally meet the public, present and then listen attentively. Once that is done, you can record your success and return to the office with the mission accomplished. This is not how the world works. From the literature we know that such an approach to public outreach incorporates many of the social amplification of risk factors that create stigmatization. The guides only make matter worse.

In the SON case, Ontario Power Generation initially started its public acceptance process by working with those individuals in the closest town who would have the most chance of agreeing to the Deep Geological Repository. The study group included business leaders, town government leaders, and members of the local workforce—all people who would be expected to have a reasonable halo effect (economic benefit) with respect to nuclear siting issues. Outreach explicitly excluded Aboriginal people and members of environmental activist organizations. In its Environmental Assessment, OPG claimed a public acceptance rate of about 90 %, but for the next 9 years OPG faced significant resistance from not only the excluded Aboriginal people of Bruce Peninsula, but also from the townspeople of the host community, Kincardine.

For most of those 9 years between announcement and the end of the CNSC's review process, OPG heard only one argument from opponents, the environmental concern over a catastrophic accident on the shores of Lake Huron. But there were actually two messages being given: the one from the environmentalists and the second culturally based argument from the SON. The core of the danger to the SON's culture was contamination, but OPG's attentive listening stopped at the surface and did not search deeper. But the SON persisted in their argument. Time was on their side.

The SON had a long view strategy—that a constant and unchanging emphasis on the Anishinaubae culture that was anger- and accusation-free would eventually win the day. The SON began each public meeting with a prayer in the Anishinaubae language, SON council repeatedly stated their responsibility as Canadian citizens, and the SON repeatedly voiced their concerns in terms of their relation to the land. Slowly, after many years of communication and exposure to the Anishinaubae ways, OPG began to hear the deeper problem of cultural identity that was at the heart of the SON's concerns. Eventually that concern was understood in full—and addressed.

There is a lesson to be learned. Public acceptance includes a substantial investment in up-front “community profiling.” Long before the first public meeting, the project team must identify subgroups among stakeholders and find communication strategies that address each subgroup's specific needs. This involves “boots on the ground” interviews and an investment in time and resources by the proponent. The interviewers need to take the pulse of each community and identify the core of each group's concerns. They must “drill down” past the surface layer of concern to find the underlying issues that produced it.

The focus of proponents and their contractors is on the finish line—the completion of the project. To reach it, there is a strong incentive to cut corners and to downplay the value of those steps that seem unnecessary. For goal-driven people the unnecessary steps include any sort of environmental assessment. This is common because environmental assessments provide no tangible value added to a construction project but cost a lot. Dismissive attitudes toward environmental and socioeconomic issues reinforce the feelings of academic superiority with regard to risk perception. This instills a sense that one is wasting their time and fosters plans to minimize efforts on social issues to maximize efforts on “things that count,” things with a hard science foundation. But there are unintended consequences to such decisions. The DGR in Kincardine, Ontario has yet to begin construction, having been delayed for ten years. A large part of the delay can be attributed to opponent challenges before the Joint Review Panel. All of the delays would not have been eliminated, but mitigating the concerns of opponents could have saved OPG years and millions of dollars. And the host community would have been better served early on because of such attention to detail.

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