Ethics, Sustainability, and Water Management: A Canadian Case Study

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Abstract This paper argues that values, perceptions, and attitudes affect decision making in water management and that a better understanding of water ethics will ensure more reliable management practices. A Canadian case study, focusing on the City of Toronto's Biosolids and Residuals Master Plan (BRMP), illustrates the importance of values in water management practices. In 2007, the author served as one of a seven member expert peer review panel to evaluate the model used by consultants to recommend biosolids management upgrades at each of the city's four wastewater treatment plants. Both the decision-making model as well as community reactions to the model and master plan revealed value judgments that ultimately affected the management process and implementation of recommendations over recent years.

Keywords Ethics · Values in sustainability · Biosolids and water management · Perceptions and attitudes in decision making

1 Introduction

According to the United Nations (2012: 1), more than 50 % of the global population now resides in cities. Within these urban areas, sanitary sewage and stormwater drainage often constitute the biggest source of pollution to surface water. Given that the United Nations (2012: 1) projects a global population increase of more than 2 billion people from 2011 to 2050, the development and management of efficient and flexible wastewater treatment systems constitute a clear priority for city planners and politicians worldwide.

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In any advanced wastewater treatment plant, untreated solids that are removed from the sewage treatment process are referred to as "sludge." The biological treatment of sludge and wastewater produces a nutrient-rich material called "biosolids." A central element, therefore, of wastewater control includes a strategy for biosolids management as well. It is expected that over the coming years, "biosolids management is likely to become even more challenging due to external forces such as the need for energy conservation, increased regulations on greenhouse gas emissions, tighter regulations on contaminant emissions to water and air, higher national standards for trace inorganic and organic contaminants in the land application of biosolids, greater urbanization, and more competition for taxpayer dollars" (Ehl Harrison Consulting Inc and Genivar 2008).

This chapter draws upon a Canadian example of a planning effort for long-term wastewater management. More specifically, it describes how a number of values and assumptions drove the development of a Biosolids and Residuals Master Plan (BRMP) for Canada's largest metropolis, the City of Toronto. A description of the methodology employed within the plan will be followed by a discussion of how ethics and value systems affected both the drafting of the plan as well as community responses. The case will be made that water management decisions are hardly value free. The final section of the paper offers recommendations on how to enhance sustainable water management by addressing the impact of ethical judgments upon decision making.

2 Case Study: Managing Toronto's Wastewater Biosolids

While both provincial and federal governments in Canada have a number of supervisory functions, the majority of wastewater systems are municipally owned and operated. (Johns and Rasmussen 2008: 83). In Ontario's capital city, "Toronto Water" holds responsibility for providing high-quality drinking water, as well as for all phases of water transmission and distribution, wastewater and storm-water collection and treatment (AECOM 2009: 1). Together with a series of pumping stations and forcemains, a sewer system stretching over a length of 9,000 km conveys 1.3 million cubic meters of wastewater to four separate treatment plants daily. As much as 174,000 wet tonnes of wastewater biosolids are generated annually (City of Toronto 2013).

More than 2.7 million people reside in Toronto, the province of Ontario's capital city. In fact, over 30 % of all recent immigrants to Canada find their home here. (City of Toronto 2012). Ontario's population growth, through both immigration and births, is expected to be higher than the national average over the coming decades as the province absorbs an increasing proportion of the national population overall (Statistics Canada 2012).

Anticipating continued metropolitan growth, officials have recognized the need for long-term wastewater and biosolids management planning. Historically, disposal of biosolids occurred through incineration or landfills. While some land

application has occurred in Ontario since the 1970s, a 1996 Great Lakes Water Quality Agreement caused the province to update regulations 2 years later. In the same year, 1998, the amalgamation of seven municipalities resulted in the creation of the new City of Toronto. Almost immediately, interest began to be expressed by councillors and planners in developing a long-term program of 100 % beneficial use of biosolids, in place of incineration or landfill disposal.

Today, there is a diversity of biosolids management options that the City of Toronto utilizes. On the one hand, "Beneficial Use Options" are said to profit from the soil-conditioning features of biosolids when they are applied as compost, pellets or dewatered cake to agricultural lands, tree farms, land rehabilitation needs, and other agricultural and horticultural locations. Other options, however, continue to be thermal reduction and incineration, landfill disposal, co-management with municipal solid waste, or green bin composting disposal, as well as market sales for use as a fuel product or proprietary fertilizer (City of Toronto 2009).

In order to plan ahead and navigate among these management options, the City's BRMP was developed in 2002 to provide guidance to the year 2025. The principal decision-making method utilized in the plan was a multi-criteria analysis (MCA) weighted scoring model, considered to be "the most common" approach used by engineers involved in significant biosolids management decisions (Osinga 2011).

It is also a method that aims to ensure that "rational, quantitative conclusions" are developed for large-scale planning decisions (Osinga 2011). Such a weighted scoring model is:

> a tool that provides a systematic process for selecting projects based on many criteria. The first step in the weighted scoring model is to identify the criteria important for the project selection process. The second step is to assign weights (percentages) to each criterion so that the total weights add up to 100 %. The next step is to assemble an evaluation team, and have each member evaluate and assign scores to each criterion for each project. In the last step, the scores are multiplied by the weights and the resulting products are summed to get the total weighted scores. Projects with higher weighted scores are the best options for selection, since "the higher the weighted score, the better" (Lessard and Lessard 2007: 27).

As was to be expected, the BRMP was developed in fulfillment of all provincial planning requirements stipulated in Ontario's Environmental Assessment Act as well as the Municipal Engineers Association Class Environmental Assessment process. Key components of this process (Osinga 2011) included:

- Stakeholder consultation
- Consideration of a "reasonable range" of alternatives
- An evaluation of the environmental effects of each alternative
- Systematic evaluation of each option
- Clear documentation and a transparent decision-making procedure

Despite this careful planning process, the issue of the draft Master Plan in September, 2004, generated serious public concern when released for a 30-day comment period. Approximately 200 responses were received, many of them from residents who objected to a recommendation that favored a fluidized bed

incinerator in their neighborhood. Consequently, in March 2005, two city councillors requested that a formal peer review be undertaken to evaluate the methodology utilized within the plan. Following a consultation process with other municipalities, industry, and scientific experts, "it was determined that the most objective way to undertake a peer review would be by forming an expert panel with selected, qualified, independent panel members whose expertise matched the specific needs of the project" (City of Toronto 2008: 3). The author of this chapter was one of the seven members selected for the peer review panel.[1]

3 The Peer Review Process and Its Findings

The panel was not charged with reviewing the biosolids management *technologies.* Instead, its task was to assess the appropriateness of the decision-making model, its criteria, and its scoring process. Overseen by Toronto Water and Toronto Public Health staff, the work of the peer review panel was coordinated and directed by Ehl Harrison Consulting Inc, together with Genivar, an environmental engineering firm specializing in integrated urban and environmental planning solutions. The peer review process included several meetings, public presentations, question and answer sessions, and preparation of a final written response to the draft Master Plan.

The panel concluded that the decision-making model utilized in developing the Master Plan was an example of those "commonly used" in generating both master plans and environmental assessments and, to that extent, it was "not unreasonable." Nevertheless, the panel did find "shortcomings in its implementation and suggested improvements, as well as additional tools that could be used to add rigor to the decision-making process" (Ehl Harrison Consulting Inc and Genivar 2008).

Specifically, five problem areas were flagged: (1) There was a lack of detail and clarity in the BRMP documentation; (2) there was "limited reach" of both the consultation and the tools that were utilized; (3) there was insufficient recognition and incorporation of public risk perceptions; (4) the process of weighting and scoring alternatives was unclear; and (5) a mediation agreement that was drawn up between one local community and the city to respond to concerns of the Master Plan was itself problematic. That agreement sought to allay concerns around the proposed incineration technology, and yet portions of the agreement were "ambiguous" and indeed appeared to be "contradictory," implying that incineration might be an option even as the spirit of the document recommended against it.

[1] Other members of the Peer Review Panel were Dr. Ida Ferrara, York University; Mr. Paul Kadota, P.Eng., Greater Vancouver Regional District; Mr. Mark C. Meckes, United States Environmental Protection Agency; Dr. David Pengally, McMaster University; Dr. Lesbia Smith, University of Toronto; and Dr. Paul Voroney, University of Guelph. Ms. Tracey Ehl, MCIP, and Ms. Fredelle Brief of Ehl Harrison Consulting Inc., chaired the deliberations of the panel.

In the end, the following major recommendations for improvements to the Master Plan and decision-making process were presented by consensus of the panel to the city staff (Ehl Harrison Consulting Inc and Genivar 2008):

- *Enhance detail and overall clarity*: A number of elements in the decision-making model and mediation agreement were not readily understandable. The panel called for further "elaboration of definitions, and step-by-step descriptions of the calculations behind some of the outcomes" (Ehl Harrison Consulting Inc and Genivar 2008).
- *Broaden stakeholder consultation*: The panel felt that some members of the public—for instance, rural communities impacted by agricultural land application or landfill disposal—had not been properly consulted. Additionally, it felt that "the City engaged a relatively small number of individuals in the various stakeholder groups, who, for the most part, may not be statistically representative of their communities" (Ehl Harrison Consulting Inc and Genivar 2008). Consequently, it was suggested that additional tools be utilized to capture broader stakeholder input that was statistically valid.
- *Acknowledge the significance of public perceptions of risk*: While recognizing that no technology is risk free, the panel recommended that a risk assessment framework be a more explicit part of the Master Plan. The public's perception of health risks associated with incineration, for instance, was a primary factor behind many stakeholder responses to the plan. A diversity of risk assessments to address uncertainties and identify best practices was suggested (Osinga 2011).
- *Improve process for developing weighting criteria and scoring alternatives*: The Master Plan presented findings but did not provide clear explanation as to the reasoning behind the numbers in the weighted scoring model. The panel suggested the need for a review of the criteria and their weightings, together with clear documentation of the calculation process so that results could be easily replicated by others and the public could better understand elements of the decision-making process.
- *Consider additional, alternative decision-making models*: While a weighted scoring model was understood to be reasonable, the panel suggested that additional methods be utilized for decision-making purposes. Such methods could include risk assessments, public opinion surveys, and a triple-bottom-line decision-making model that focused on minimizing environmental, social, and economic impacts (Osinga 2011).
- *Re-assess scoring priorities*: Rather than privileging financial, technical, operational, and managerial elements, the panel suggested that higher values needed to be placed upon community concerns, public health, and environmental considerations (Osinga 2011).
- *Establish a longer term perspective on biosolids management*: Since there is a need to continually update the public about biosolids options, the panel suggested a long-term strategy and resource commitment to ensure public education programs. Additional quantitative surveys and qualitative research were

proposed in order to "help to set the planning context for future projects" to a 50—rather than 25 year—planning horizon (Ehl Harrison Consulting Inc and Genivar 2008).

The peer review panel's recommendations were presented to the City of Toronto in February, 2008. Following a number of public information sessions, the city initiated a Biosolids Master Plan (BMP) Update in 2008. AECOM—a consulting engineering firm—was hired to finalize the Master Plan which was approved by city council in 2010 and provides a blueprint for biosolids management to the year 2055.

A number of improvements to the original draft Master Plan were made, following the peer review process. Key changes reported by the City of Toronto (2009) included the following:

- Evaluation criteria and categories were revised in the weighted scoring model to ensure that they were more easily understood and legible to a lay audience.
- Quantitative surveys were conducted by telephone and focus groups organized to obtain statistically relevant public feedback about biosolids management options and decision-making criteria.
- Rather than providing a single, universal set of recommendations for such a large metropolis with a diversity of community expectations, options were evaluated with respect to the specific needs of each of the four wastewater treatment facilities, within the context of the city's overall needs.
- How each management option was scored was explained in greater detail, ensuring that information was provided about the meaning of each criterion and why it was used in the decision-making process.
- Information was updated with respect to developments in biosolids technologies and management opportunities.
- A more holistic accounting of impacts and opportunities was utilized, drawing from a "triple-bottom-line" approach that addressed environmental, social, and economic concerns of the city.
- While weightings are often evenly distributed in such cases of decision making, in this instance, the final plan weighed the environmental and social indices more heavily than cost indices, reflecting community values (AECOM 2009: 12).
- The overall strategy was now to maximize programs that encourage beneficial use of biosolids cake, relying upon landfill disposal purely as a "contingency measure" (AECOM 2009: 16).

Seven years of consultants' reports, peer review panel deliberations, focus groups, surveys, and public workshops have resulted in the final approval in December, 2009, by city council of a BMP for the City of Toronto. Certainly, the Master Plan management process has required a significant commitment to date, both financially as well as in terms of human resources.

One cannot help but wonder however: might the process have been more streamlined, had underlying values and judgment calls been more explicitly addressed? What were some of those values and ethical assumptions that affected the process of decision making? The following section looks at those questions specifically.

4 Values, Judgments, and Ethical Assumptions

It is common to perceive the role of ethics as a matter of clarifying universal moral principles to provide a theoretical framework for complexities of decision making. Through such a top-down model of justification, the expectation is that ethics consists simply of "applying a general rule (principle, ideal, right etc.) to a particular case that falls under the rule" (Beauchamp 2005: 7).

As appealing as such a model may be to some, others argue that ethics is more than a top-down intellectual exercise of applying theories and principles to specific situations. Rather, ethics is better understood as a bottom-up process of deciphering implicit values that underlie decision-making practices. Moral principles, on such a reading, are derivative, informed by the vagaries of each particular case, rather than intellectually conclusive, foundational, and resolved in advance of engaging with lived experience (Beauchamp 2005: 8).

To be sure, the fact is that "sometimes we do not *know* what our actual beliefs and values are" (Hinman 2013: 5). Values are often deeply embedded in our daily decisions and, in that respect, are implicit or even operate at a subconscious level (Stefanovic 2012). In that regard, the task for philosophers is perhaps less one of creating grand, speculative theories than of serving as "stand-in interpreters" who help communities to clarify and critically evaluate those values that impact in a significant way upon important decisions (Morito 2010).

When it comes to the case of biosolids management within the City of Toronto, values infused the decision-making process from the very start and on a number of different levels. Let me draw upon a few salient examples in order to then explore how they impacted upon the long process of evolving a master plan.

Consider the decision taken by engineers to base the original draft of the Master Plan on a quantitative, weighted scoring model. The 2004 report points out that, given the complexity of biosolids and residuals management processes, "experience in other communities has shown that developing a *systematic, stepwise method* for making decisions at the start of the project helps to focus and clarify decision making" (KMK Consultants 2004: 80. Italics added). Employing such a logical model is indeed common when it comes to large-scale planning projects, precisely because it is seen to set a framework "for a *systematic, rational and replicable* environmental planning process" (KMK Consultants 2004: 7 Italics added). Employing such an apparently "rational" and "replicable" model of decision making was intended to enable the identification of "actual benefits and impacts of the specific option" by way of "a quantitative comparison of one alternative to another" (KMK Consultants 2004: 83).

The language utilized here reflects a positivist paradigm that is characteristic of the mainstream western understanding of modern water management which begins, as some ethicists point out, "with humanity as the main focus of moral concern, separate from and generally understood to be superior to the rest of the world" (Brown and Schmidt 2010: 268). The decision-making model was intended to ensure a process that was intended to be *objective, quantitative, systematic,* and

methodical. By virtue of presenting "actual" numerical *scores* for the various alternatives, the perceived value of *technical efficiency and control* was a primary driving force behind the model. Indeed, the way in which the numbers were presented was meant to indicate that the findings were not merely subjective but rather had the verity and scientific objectivity of mathematical calculation behind their truth value. The "right" way, on this reading, to undertake a comprehensive and rational decision-making process was to ensure that the value of quantification was taken seriously.

For instance, the plan noted that "value weights were applied to differentiate between those individual criteria which are very important, and those which are less important" (KMK Consultants 2004: 83). However, it is important to acknowledge that "value weights were applied" not in some absolutist manner but by actual *people*—human subjects who were engaged in the interpretation and prioritizing of criteria according to judgment calls that *were not always made explicit within the final plan*. To be sure, a sensitivity analysis was undertaken as part of the process and it was deemed significant that the same options were consistently identified as receiving the highest scores (KMK Consultants 2004: 157). Overall, the "value" of calculation was supreme, and it was assumed that such a rational approach would ensure the greatest distribution of good overall to the citizens of Toronto.

While the overt quantitative approach was meant to suggest *objectivity* of the final recommendations, the fact is, however, that the vocal reaction of the local community revealed that the scoring process was not as calculatively certain as it may have been meant to appear.

Moreover, the calculative paradigm of this model betrayed the common characteristic of many large-scale environmental planning processes, that is, it assumed the validity of a *utilitarian value system.* Utilitarianism is arguably one of two dominant schools of thought in the western ethics tradition, the other being deontology (Callicot 2005: 284). Arising from the writings of John Stuart Mill and Jeremy Bentham, utilitarianism aims to facilitate "the greatest good for the greatest number," usually of human beings, although often, animals are included in the formula (Mill 1863; Bentham 1970). Some interpret the "greatest good" in terms of "greatest happiness," while others refer to the significance of promoting the "greatest welfare" overall, but in any case, the utilitarian theory suggests that the morally superior decision is the one that advances the greatest good overall.

Cost-benefit analysis that seeks to weigh advantages and disadvantages in order to obtain an optimal result is a penultimate example of utilitarianism in action within the field of economics. But a utilitarian framework also emerges from other common decision-making models as well. The weighted scoring approach utilized in the City's BMP reveals a utilitarian value framework to the extent that the process was meant to deliver a set of recommendations that weighed alternatives in an objective manner and quantified mathematical scores to advance the greatest net benefit overall. As the writers of the plan explained, by way of systematic evaluation and weighing of the advantages vis-à-vis disadvantages of a particular alternative, the aim of evaluating each alternative was "to determine their *net* environmental effects" (KMK Consultants 2004: 7).

Needless to say, and as the peer review panel members themselves stated, such a utilitarian model of decision making that aims to advance the "greatest good for the greatest number" of citizens in the City of Toronto is hardly unreasonable. On the contrary, it is frequently utilized because it is deemed to be most efficient and fair, satisfying the demands of distributive justice, particularly when it comes to large-scale environmental decisions that affect a large population, such as biosolids management.

However, while deemed by many to be a "reasonable" approach, the City's Biosolids decision-making model left little room for stakeholder values that emerged later and that represented a second dominant western model of values, that is, a *deontological* rather than utilitarian moral framework. "Deon" is the Greek word for "duty," and so "deontological" approaches emphasize notions of duty and *individual rights*. Philosopher J. Baird Callicott offers the example of Roman gladiator contests: Quantitatively speaking, thousands of spectators received great satisfaction at the expense of the pain incurred upon five or ten gladiatorial contestants; nevertheless, each of those contestants had a *right* to human dignity and respect in principle that today we recognize must override the "repugnant outcome of the unbridled utilitarian welfare calculus" (Callicott 2005: 285).

Drawing upon similar arguments, residents of a single neighborhood were opposed *in principle* to the incineration option that was calculated within the original draft Master Plan as an option that promoted "the greater good" to citizens of Toronto as a whole. Those neighborhood residents argued that they had a *right* to refuse the incineration option, *no matter the overall welfare calculus.* Because they had longstanding concerns about impacts upon human and environmental health of a previous incineration unit within their community, their view was that the municipal government had a *duty* to respect their concerns and residents had a right to demand such a hearing, irrespective of the calculation of overall good to the city as a whole.

This underlying divergence between utilitarian efficiency of the greater good, on the one hand, and a deontological belief in principles of human rights—is commonly observed and often helps to explain what is at the root of many stakeholder conflicts (Stefanovic 2012). Had the engineers who drafted the original Master Plan recognized the deep significance of this community's rights-based objection to incineration, they might have identified different biosolids use options right from the start.

In that connection, it becomes important in any decision-making process to (a) make such divergent value systems explicit, early in the game and (b) encourage ways in which to communicate *across* the values divide. Philosopher Bruce Morito offers an example of how this strategy might be employed. He describes a forum where First Nations' people, industry representatives, and others came together to discuss resource management issues (Morito 2010). A resource manager approached him, frustrated that the Aboriginal communities were unwilling to allow the building of a dam on their territory, despite being offered "more than adequate" compensation. Morito turned to him and asked whether he would agree to sell his daughter into slavery for a "more than adequate" amount of money.

Clearly, the manager was unwilling to do so, but through the analogy, he began to better understand the First Nations' unwillingness to compromise their principles with respect to the land. Morito (2010: 110) concludes that the basic idea of bringing value systems to light is to "seek mutual understanding among stakeholders concerning their values and then allow this understanding to generate prescription principles."

Admittedly, identifying taken-for-granted value systems and interpreting conflicting moral paradigms is not a easy task. But the argument can be made that this is precisely the role that ethicists and philosophers should be undertaking. Otherwise, values will affect perceptions and attitudes of both experts and the broader public in ways that remain hidden, even as they exert a powerful influence upon decisions made.

For instance, let us consider another example of how values and attitudes affected the scoring of alternatives within the City of Toronto's Biosolids decision-making model. During the master plan peer review process, the team recognized that scoring criteria such as resource inputs to the biosolids management system were given more weight and importance over public health and environmental outputs. Financial, operational, managerial, technical performance and construction considerations, representing 50.9 % of the weight in the overall scoring, were found to be privileged by the engineering firm who prepared the initial draft plan, over community, public health and natural environment considerations which represented only 49.1 % of the weight of the overall scoring. "The consequences of affording so much weight on the input criteria," the panel reported, "is the potential of reduced sensitivity to concerns expressed by external stakeholders" (Ehl Harrison Consulting Inc and Genivar 2008: 34–35).

In fact, once those external stakeholder *were* taken into account, the decision-making model was redesigned to emphasize community values in a more meaningful way. As the Master Plan Update reports, "although in this type of model, weightings are usually evenly distributed between the three indices, for the BMP Update, the Environmental Index was weighed more heavily, followed by the Social and Cost Indices. This is to reflect the level of importance of each criteria group to the public and consulted stakeholders" (AECOM 2009: 12). In other words, while *technical and economic* concerns were more heavily weighted by engineers in the earlier drafts of the Master Plan, it gradually became evident, through a more sustained stakeholder communication process, that an emphasis on *environmental sustainability and health* considerations more accurately reflected the values of the community as a whole. Had such a meaningful consultation process occurred earlier, presumably time and money will have been saved by the city because the plan will have reflected the pervading community values from the start.

Another way in which values arise on water management projects such as this one relates to perceptions and attitudes regarding *risk*. The peer review panel recommended that "public perception of the risks related to both human health and other environmental impacts associated with various technologies should be addressed across all communities" (Ehl Harrison Consulting Inc and Genivar 2008: 43). There

was a duty, the panel felt, of the City of Toronto to demonstrate that it was following best practices "to mitigate risks to the public's health and safety, so that no community bears a disproportionate amount of risk" (Ehl Harrison Consulting Inc and Genivar 2008: 43). For these reasons, the panel proposed that a risk assessment framework be added to the Master Plan.

Interestingly, the city disagreed. A staff report indicated that including such a risk assessment framework "would be costly, time consuming and, in this instance, would not add significantly to the decision making process" (City of Toronto 2008: 6). Yet, the fact is that excluding risk assessment in any project can itself be a risky move: Management professionals recognize that "addressing risks proactively will increase the chances of accomplishing the project objective. Waiting for unfavorable events to occur and then reacting to them can result in panic and costly responses" (Gido and Clements 2012: 284). In those instances where uncertainty exists and the stakes are high, risk management is particularly crucial. It is only by incorporating a risk framework that "surprises that become problems will be diminished, because emphasis will now be on proactive rather than reactive management" (Kerzner 2001: 904).

In the case of the Toronto BMP, engineers did not themselves adequately anticipate or plan for the risk of antagonistic community responses to their initial draft plan. Master Planners' neglect of perceived risks of incineration technologies by community members in one Toronto neighborhood eventually became a significant stumbling block and cause of delays in the overall planning process.

Other ongoing concerns of community members reflected important value judgments regarding risks, even with regard to the safety of "beneficial use" options such as land applications. An article in a leading Toronto newspaper expressed concern, for instance, that biosolids constitute a "disaster waiting to happen" (Vynak 2008). Certainly, environment ministry officials promote biosolids as a "safe" alternative to other commercial land applications, insisting that guidelines are "both up to date and adequate" (Vynak 2008). The feeling within government circles is that risks are thereby mitigated to a reasonable degree.

Others, however, are not convinced. Opponents argue that biosolids "may contain thousands of toxic chemicals, the effects of which we know little about. Regulatory guidelines for spreading biosolids on farmland are outdated and inadequate," having been updated as far back as 1998 (Vynak 2008). Stories abound about rural residents near sludged properties who complain about respiratory and stomach problems, headaches, nausea, rashes, and fatigue. Soil scientists express concerns about concoctions of pharmaceutical medications excreted in human waste or pathogens like *Escherichia coli* bacteria persisting through the water treatment process and affecting the health of the land and surrounding residents. "I don't know how (the Ministry of the Environment) can believe regulated heavy metals are the only contaminants in sludge we need to worry about," laments soil scientist Murray McBridge (Vynak 2008).

To be sure, there is no such thing as "no risk" in life. In the words of the peer review panel, it is always helpful to remember that "there are no biosolids management options that are totally risk free" (Ehl Harrison Consulting Inc and

Genivar 2008: 43). Nevertheless, "risk management is not done by machines or robots…. It requires human judgment" (Hillson and Murray-Webster 2005: 19). Different risk personalities assess risk differently. For instance, as has been shown in other instances, mothers are frequently unwilling to balance risks and benefits through a utilitarian calculus when it comes to the health of their children, arguing instead in favor of a precautionary approach to risks (Stefanovic 2012). To argue that a sustained pattern of risk management is either value free or not worth the investment is simply irresponsible in water management scenarios.

A range of other judgment calls can impact upon project decisions. How the problem is defined in the first place inevitably reflects attitudes regarding what ought to be included or excluded within the scope of a project. In the Toronto Biosolids example, choices about how to define and scope evaluation criteria, together with the decision to rely upon a particular scoring method, were seen by the peer review panel to have clearly influenced the outcome of the original biosolids assessment (Osinga 2011: 7). That only urban residents were consulted may have seemed reasonable in the beginning inasmuch as all water treatment plants were geographically located within the urban core. However, the potential for rural applications of biosolids meant that rural municipalities should have also been consulted. The peer review panel, therefore, recommended expanding stakeholder consultation beyond the city limits. The takeaway lesson here is that an ethical stakeholder management process is one that ensures that less vocal contributions (in this case, the rural municipalities) are meaningfully represented.

Another example of how values affect project definition relates to how the project as a whole is perceived within the context of the broader community plan. While incineration was a management option that was scored third for one major wastewater facility, ultimately, it was not recommended within the final, Master Plan Update because of the city's "plans to make significant investment in a 20-year program to improve the waterfront" within the surrounding area (AECOM 2009: 17). In other words, when the incineration option was considered within the larger spatial and temporal city planning scales, it was no longer seen to be as viable a biosolids management option for this particular community, despite its apparent technical efficiency. The fact that a longer time frame—amended from 2025 to 2050—was proposed similarly contextualized options within a different and broader planning horizon. Both the spatial and temporal *contexts* influence the identification and assessment of water management options, as the case from Toronto clearly indicates.

5 Next Steps: Enhancing Water Management Practices with Ethics

As we have seen, human factors and judgment calls affect management decisions at many levels and at all stages of the decision-making process. Few decisions can be said to be meaningfully value free. In that regard, the job for ethicists is to help

to identify and critically evaluate ethical dimensions of water management decisions. Doing so will help to anticipate and proactively address potential conflicts that might emerge as a result of value judgments that frequently operate implicitly within the decision-making process.

Sometimes, those value judgements emerge due to different theoretical beliefs, such as in cases where utilitarian and deontological values conflict. In other cases, they underlie our risk assessments of the "safety" of new technologies. In fact, how projects are scoped—which alternatives are deemed to be "reasonable" and how they are quantified within scoring systems—also reflect judgment calls regarding what ought to be included and/or excluded as a viable option in the decision-making process.

It is naïve to assume that value judgements do not matter. They can affect policies and politics: As the City of Toronto's Biosolids Management example shows, when a community's values and risk perceptions are not taken seriously by planners, a project can experience severe delays, particularly when a community elicits the voice of a powerful politician to represent their core values.

Water ethicists Peter Brown and Jeremy Schmidt summarize the point succinctly when they conclude that:

> from a decision making perspective, purely rational and technocratic management cannot go far enough…What we also need is a new narrative that positions scientific knowledge and technological know-how as part of the broader systems people seek to manage, and which include the cultural, religious and ethical values by which the managers and users are informed (2010: 274).

It is in the spirit of such a new narrative that this paper invites those involved in the water management process to reflect upon and to critically evaluate taken-for-granted values that affect decisions that are, ultimately, always more than merely technical.

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