

# Examining the emerging environmental protection policy convergence in the Ontario municipal drinking water, wastewater and stormwater sectors

Edgar Tovilla and Kernaghan Webb

## ABSTRACT

This study examines the governance approaches applying to Ontario's municipal water management activities and observes an environmental policy convergence occurring in two different dimensions: across the drinking water, wastewater, and stormwater aspects of municipal water activities with respect to governance approaches, and federal, provincial, and municipal governments in terms of drawing on private management system standards to supplement conventional regulatory requirements. This study supports the proposition that municipal water governance approaches are developed within a context that includes both state-based requirements and non-state market-oriented standards such as ISO 9001 and ISO 14001, and this context facilitates convergence and calibration between and among state-based and private governance at the public policy level adopted by municipalities. In addition to increasing use of private environmental management systems (EMSs) by Ontario municipalities as methods of addressing operational challenges they face, Canadian courts are also referencing EMS in their decisions. This article suggests that EMS standards such as ISO 14001 can be useful supplements to state regulations, and this supplementing would not be characterized as supplanting or substituting conventional state-based regulation, but rather as a form of practical and conceptual 'bridge' between public and private forms of regulation.

**Key words** | DWQMS, environmental management systems, ISO14001, policy convergence, regulation, Walkerton

**Edgar Tovilla** (corresponding author)  
Environmental Applied Science and Management,  
Ryerson University,  
Toronto, ON,  
Canada  
E-mail: [etovilla@ryerson.ca](mailto:etovilla@ryerson.ca)

**Kernaghan Webb**  
Department of Law and Business, Ted Rogers  
School of Management,  
Ryerson University,  
Toronto, ON,  
Canada

## INTRODUCTION

In May 2000, an estimated 2,300 people became seriously ill and seven died from exposure to microbially-contaminated drinking water in Walkerton, Ontario, a town of approximately 5,000 people located northwest of Toronto (Hrudey *et al.* 2002). The town's water supply came from groundwater wells, which became contaminated with *Escherichia coli* (*E. coli*) by surface water runoff from adjacent farmland (Abouchar 2003). Following the Walkerton tragedy, the

drinking water governance framework was redesigned with the new *Safe Drinking Water Act* (2002), the *Nutrient Management Act* (2002), the *Clean Water Act* (2006) and twelve regulations and several guidelines (Appendix A, available with the online version of this paper). On the one hand, the province introduced a streamlined process of permitting, approval, and implementation of a new administrative infrastructure, and a requirement for a new quality management standard, the Drinking Water Quality Management System (DWQMS); however, while the state-based *drinking water* governance structure was re-formulated and modernized to incorporate a management

This is an Open Access article distributed under the terms of the Creative Commons Attribution Licence (CC BY 4.0), which permits copying, adaptation and redistribution, provided the original work is properly cited (<http://creativecommons.org/licenses/by/4.0/>).

doi: 10.2166/wqrj.2017.043

system approach, in the period immediately following the Walkerton tragedy, the *wastewater and stormwater* sectors was not similarly adjusted, remaining with basically the same conventional, minimalistic governance structure established in the 1950s. We observe that ten years after the Walkerton tragedy and the new drinking water legislation, there began to be policy convergence, bringing the municipal wastewater and stormwater governance structure into alignment with the risk-based management system approach already adopted in the drinking water sector.

This study focuses specifically on the use of private voluntary standards and certification for EMS and quality management systems (QMS) that are particularly relevant to municipal water, wastewater, and stormwater systems, specifically the ISO 9001 (QMS) and ISO 14001 (environmental management system (EMS)), two high profile standards of the International Organization for Standardization (ISO). While the standard ISO 26000, for corporate (and other organizational) social responsibility systems (CSRS), is also potentially relevant to municipalities, it is a guidance standard, not capable of certification like ISO 9001 and ISO 14001, and is only mentioned here to note that organizations can undertake societally beneficial voluntary actions above and beyond quality and environmental management (Webb 2015a, 2015b). The provincially required DWQMS, which was mandated for municipalities in 2006, as a response to the Walkerton Inquiry (O'Connor 2002b), is founded on a quality management approach similar to ISO 9001 (see Provincial government role section). The recently updated ISO 14001 (2015a, 2015b), incorporates eco-design and life cycle assessment, like ISO 26000, and places an emphasis on the organization's ability to influence society and a full range of stakeholders. Figure 1 shows the author's illustration for the interconnected relationship of these standards in the context of drinking water quality and wastewater/stormwater sectors.

Recent federal and provincial legislation specifically refers to EMS standards, the ISO 14001 certification or elements of ISO 14001. Federal and provincial pollution control legislation, and enforcement actions pursuant to this legislation, against corporations, municipalities, and other organizations, draws primarily on a strict liability offence model, with a due diligence defense (Webb & Morrison 2004; Saxe 2011), by which accused organizations can

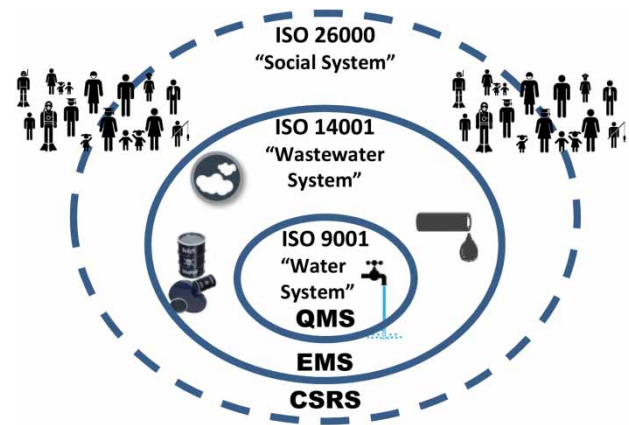


Figure 1 | ISO Standards in the context of water/wastewater systems.

escape liability by establishing that they had in place management systems that demonstrate they exercised reasonable care, and as such, they provide an additional motivation for municipalities to adopt a structured EMS similar to that in international standards (such as ISO 14001). For municipalities that have systematically implemented an EMS in accordance with the terms of ISO 14001, such a standard may decrease the likelihood of a violation taking place, and where violations do occur, it may allow the municipality to raise a due diligence defense. In this way, the law and the courts are providing another impetus for policy convergence in the form of a legal requirement that municipalities comply with a formal EMS such as ISO 14001.

In this article we contend that Ontario municipal water governance approaches have been developed against a backdrop of state-based requirements and private regulatory initiatives, and this has led to a certain amount of calibration and convergence between state-based and private governance at the public policy level in terms of ideas and instruments (modalities) adopted by the municipalities. Based on a review of available information discussed in this article, the suggestion made here is that adoption of EMS approaches codified in ISO 14001, applied in the context of Ontario's municipal wastewater and stormwater sectors, can be expected to have a neutral or positive effect on operational performance. This would be similar from the reported effect of the DWQMS: according to the Ontario's drinking water Chief Drinking Water Inspector, Ontario's drinking water 'continues to be among the safest

and best protected in the world' (MOECC 2016). The report notes that:

- 99.8% of drinking water tests from municipal residential water systems met Ontario's rigorous health-based standards;
- 74% of all municipal residential drinking water systems achieved a 100% inspection rating – a 7% increase since 2014–2015; and
- 99.6% of drinking water tests from systems serving designated facilities such as daycares, schools, or healthcare centres met Ontario's drinking water quality standards (MOECC 2016).

For municipal wastewater and stormwater sectors, while there is at this time no legislated government requirement that EMS standards be adopted, there is a critical mass of knowledge, systems infrastructure, and experience, generated after ten years of DWQMS, that contributes to municipalities gearing towards adopting specific elements of EMS. Scholars have suggested that where a critical mass of private sector, government and other actors, instruments, institutions, and processes has sufficient density, it can support widespread adoption and use of a particular practice (Webb *et al.* 2017). Based on a review of current municipal activity in Ontario, we found that some Ontario municipalities are also voluntarily adopting EMS-related practices to address eco-design, climate change, and life cycle assessment (in the form of asset management plans) as part of their water management approaches.

Recent research concerning government and industry participation in sponsored voluntary environmental programs has found that both government and industry recognize the importance of the brand value of EMS in part because of the influence of their stakeholders on their business and environmental practices (Darnall *et al.* 2010). Also, current environmental management literature suggests that increasing adoption of voluntary standards (such as ISO 14001) provides a variety of potential benefits such as relief from the need for certain onerous command and control measures, enhanced cost efficiency, improved stakeholder relations, among other things (Henriques & Sadorsky 2008). Others have concluded that organizations are motivated to adopt such standards to increase their internal

efficiency and external legitimacy, as well as to creating shareholder value (Hart & Milstein 2003).

The analysis in this study is structured around two different convergence dimensions: the convergence between public and private governance approaches; and the convergence among the three levels of government towards the use of management system standards. This article suggests that the increasing adoption by municipalities of private management systems standards is creating a form of conceptual 'bridge' between public and private forms of regulation. The focus of this study is on examination of the environmental protection policy convergence in the municipal waters sectors by adopting management systems, and not on the implementation of these management systems. In other words, we are focusing on the rule instrument and overall governance context, while recognizing that implementation, and the factors affecting implementation, such as organizational structure and resistance to change, are also important areas for study (Ivanova *et al.* 2014).

For this article, in order to understand state and private forms of regulation, Webb's definition of *rule instruments* is adopted (Webb 2005); he indicates that rule instruments articulate objective criteria designed to influence or control behaviour, that allow for evaluation of whether an entity or an activity is or is not in compliance with the criteria (Webb 2005). Following this definition, Webb notes that rule instruments include state-based laws and regulations, inter-governmental arrangements, as well as non-state (private) voluntary standards, certification programs, and self-regulatory codes (Webb 2005). The term *private sector governance* is adopted from Webb (2004), and is intended here to encompass the 'full range of ways that organizations not directly affiliated with the State attempt to organize their affairs'. We discuss both private sector governance approaches and state-based approaches in subsequent sections of this article.

The article first discusses private governance approaches and their relevance to municipal water systems, and then examines the existing state-based regulatory framework for municipal water, wastewater and stormwater sectors in Ontario. This is followed by a discussion of policy convergence as applied to Ontario municipal water governance. Finally, conclusions are provided.

## PRIVATE GOVERNANCE APPROACHES

Public opinion, as well as the pressure of environmental non-government organizations, the media, and others can all play important roles in encouraging organizations to adopt non-state voluntary rule instruments (private governance approaches) that may be 'more stringent' than the criteria codified and required by government authorities in laws (Fulponi 2006; Delmas & Montiel 2008). Private governance approaches may be developed by standards bodies, industry associations and others in response to public concerns, human tragedies, environmental crisis, or they may be developed and adopted more as 'precautionary measures, before concerns and tragedies arise' (Kollman & Prakash 2002). On the one hand, there are compliance and other operational costs associated with companies, municipalities and other organizations adhering to private rule instruments that go above and beyond the requirements set by state-based regulations (Kafetzopoulos & Psomas 2015; Alvarez-Garcia & RioRama 2016). Further, adhering to private standards may reduce the likelihood of problems arising, could provide a defense should mishaps occur (a due diligence defense, as discussed elsewhere in this article), and may 'enhance public and stakeholder acceptance and legitimacy' (Halley & Boiral 2009).

This study focuses on private QMS and especially EMS standards of the ISO, applicable to municipalities and other types of organizations, because of the dominant role these standards play around the globe, and because of their relevance to the drinking water, wastewater and stormwater operations of municipalities. The ISO is an independent, global non-governmental membership organization made up of members from the national standards bodies of 162 countries and is the world's largest developer of voluntary international standards. ISO has published more than 19,500 standards covering almost every industry (ISO 2015). Created by ISO with specific purposes and mandates, all standards are established by technical committees and subcommittees. By definition, all ISO standards are voluntary in the sense that ISO is a non-state body and therefore is incapable of requiring an organization to comply with its standards the way governments can require and enforce adherence to laws. All ISO standards are reviewed every 3–5 years to determine whether a revision

is required to keep the standards current and relevant for the marketplace (ISO 2015).

Historically, ISO can be traced back to 1926, with the International Federation of the National Standardization Association, which was disbanded in 1942. ISO was founded shortly after World War II, in 1947. ISO began publishing its QMS series of standards in 1987. The ISO 9001 quality management standard sets out a plan-do-check-act model to assist an organization in consistently meeting a certain quality for its products or services, and it is possible for organizations to be certified by a third party as meeting the terms of ISO 9001 (Martincic 1997; Nichols 2013).

It was not until 1971 that 'environment' was brought into the ISO agenda. A year later the United Nations held its Conference on the Human Environment in Stockholm, and a declaration was made for the preservation and enhancement of the human environment (Martincic 1997). By 1987, a World Commission on the Environment and Development provided the first globally accepted definition of 'sustainable development'. The ISO 14000 management series of standards emerged from international developments including the Rio Summit on the Environment held in 1992 (Martincic 1997). Established in 1996, ISO 14001 has become the world's most popular standard for EMS. As of 2014, the ISO reported more than 300,000 ISO 14001 certifications in 171 countries (ISO 2015), and more than 1.5 million companies are ISO certified worldwide (ISO Survey (online): [www.iso.org/the-iso-survey.html](http://www.iso.org/the-iso-survey.html)). A chronological description of the history of ISO 14001 is included in Appendix B, available with the online version of this paper.

We have already noted that Ontario has adopted a QMS approach for municipal drinking water (MDW) systems (i.e. drinking water) regardless of source water (surface or groundwater), or location (equally applicable to all 444 municipalities in Ontario). The required DWQMS does not address environmental impacts, and as such environmental aspects are left as a voluntary continuous improvement element for municipalities to adopt.

Building on the plan-do-check-act management system model found in the ISO 9000 series of standards, key elements of an ISO 14001 EMS include development of an environmental policy, ensuring that there is proper planning, implementation and operation of the policy, the need for monitoring of the EMS and corrective action, regular

management review of how well the EMS is operating, and continual improvement (ISO 14001 2015a, 2015b).

In the Canadian context, the 1991 case of *R. v. Bata Industries* was an important example of judicial recognition for the value of EMSs (Greenbaum & Wellington 2010). The *R. v. Bata Industries* case was a legally significant and highly influential case dealing with the concept of the application of the due diligence defence in an environmental context, and directors' liability (Greenbaum & Wellington 2010). The case raised public awareness about the value of an EMS. The court pointed to the need for corporations to establish policies and systems for pollution prevention, record-keeping and proper labelling of hazardous substances, as well as for ensuring supervision and adherence to established policies and systems, regular reporting to directors, including the reporting of substantial non-compliance in a timely manner, allocation of sufficient resources, and awareness of standards, including those of other industries dealing with similar environmental risks. Many of the EMS elements resemble those contained in ISO 14001. Judge Ormston of the Ontario Provincial Court identified the following as one of the criteria for due diligence of the directors of a corporation:

'...The directors should stay informed of standards of their industry and other industries that deal with similar environmental pollutants or risks...' (Greenbaum & Wellington 2010, p. 584)

The importance of the *Bata* case is that it shone a spotlight on the need for EMS as part of a corporation's due diligence approach to comply with environmental legislation. In effect, voluntary standards such as those in the ISO 14000 series of standards, and audits performed by third-party organizations, are a useful tool to assist firms in meeting the requirements of environmental law. The *Bata* case can be interpreted as providing a strong incentive for regulated entities to adopt and implement voluntary EMS to substantiate their assertions that they were exercising reasonable care.

The ISO 14000 series involves a number of standards that are intended to assist corporations in managing their environmental responsibilities. The objective of this standard is 'to support environmental protection and prevention of pollution in balance with socio-economic needs'

(ISO 14001 2015a, 2015b). The ISO 14001 sets out criteria for an EMS, regardless of the organization's activity or sector. The standard was updated in 2004 and more recently in September 2015. The update encourages the adoption of new operational practices, particularly eco-design and climate change, and life cycle assessment. The continual improvement element of ISO 14001 provides flexibility for adopters to define what future goals they are to achieve.

A review of the academic literature concerning ISO 14001 has centred on such things as the motivation for firms adopting the standard, the value of implementing it and critical factors for successfully implementing it (Fulponi 2006; Searcy *et al.* 2012). Studies have also documented other benefits of being registered to the standard, such as a possible competitive advantage (Psomas *et al.* 2011; Ionascu *et al.* 2017). Other studies have identified problematic aspects of ISO 14001. For example, some have suggested that reporting and validation are deflectors of attention rather than performance and process improvements (Kollman & Prakash 2002; Chatterji & Toffel 2010; Simpson & Sroufe 2014). Others have noted that third party certifications to ISO 14001 show only modest environmental performance improvements, and do not require public disclosure of the certifications (Darnall & Sides 2008; Alvarez-Garcia & RioRama 2016).

Supporting standards in the ISO 14000 series (24 in total) focus on specific issues such as audits, communications, and life cycle assessment, as well as environmental challenges such as climate change. Relevant supporting standards include:

- ISO 14001: 2015 – requirements of an environmental QMS.
- ISO 14004: 2004 – general guidelines on principles, systems and support techniques.
- ISO 14006: 2011 – guidelines for incorporating eco-design.
- ISO 14044: 2006 – guidelines for life cycle assessments.

The revisions to ISO 14001:2015 attempt to improve alignment with other ISO management system standards, with the following key changes:

- Greater involvement of the leadership team in the management system to ensure the whole organization will



be motivated towards the organization's goals and objectives.

- Improved risk management and environmental performance to protect the environment and reduce the risk of regulatory fines.
- A new approach applicable to all new ISO management systems standards to integrate multiple, integrated management systems.
- Increased focus on lifecycle perspective rather than lifecycle assessment, with emphasis on the supply chain, looking at the stages immediately adjacent and either side of the organization operations and the potential for influence.
- Eco-designs to embrace innovation (Leehane 2015).

Building on the ISO 14001 established in 1996, and privatization schemes for the operation and management of municipal assets in the 1990s, it provided an increased impetus for adopting EMS for the water sectors. Private companies seeking to operate municipal water systems sought ISO 14001 certifications, as a way of signalling environmental responsibility and thereby securing an advantage over other competitors (Halley & Boiral 2009). Within this context, primarily in the UK and France, but also in the Americas: 'it was a decade of experimentation with asset sales' (Brubaker 2003). Currently, public tenders for operation of water operations may include contractual requirements for EMS and specifically ISO 14001 (e.g. Halifax Water 2017), and some federal agencies also have it as an operational requirement (e.g. Canadian Nuclear Safety Commission – REGDOC 2.9.1. Environmental Protection Policy (Online) <https://cnsccsn.gc.ca/eng/acts-and-regulations/regulatory-documents/published/html/regdoc2-9-1/index.cfm>). The use of contracts by organizations in order to impose codes and standards on their partners is common (Webb 2012). Table 1 provides examples of some private companies that are operating water/wastewater systems that have secured ISO 14001.

## STATE-BASED REGULATORY FRAMEWORK

In Canada, the regulatory governance of the water, wastewater, and stormwater systems is shared by the three

**Table 1** | Private companies with ISO 14001 certifications

Company	System ISO 14001 Certified
EPCOR Water (Edmonton)	Adopted ISO 14001 and CSR policy (Canada and USA)
Toronto Hydro	Adopted ISO 14001 and OHSAS
Suez	Adopted ISO 14001 on some sites worldwide
Veolia Water Technologies	Adopted ISO 14001, and ISO 9001 for some sites and for some technology equipment, respectively
Southern Water (UK)	Adopted ISO 14001, and all operations are certified worldwide
Aguas de Barcelona (Spain)	Expanded the scope of ISO 14001 to cover all its wastewater operations in 2016

levels of government. For the most part, the primary constitutional responsibility for waters within a province lies with the province (ECCC 2015), but the federal government and municipal government also play important roles. At the behest of provincial governments, municipal governments are given the mandate of developing and implementing the water infrastructure needed to satisfy urban and rural planning demands, as well as ensuring that their approach is in compliance with provincial requirements. This often means that municipalities adopt industry best management practices (BMPs), and these practices may go above and beyond minimum regulated requirements. Provincial governments are responsible for regulation of the water systems and operations. Before reviewing key aspects of the provincial regulatory framework, we will first examine the federal role.

## Federal government role

The government of Canada has the constitutional responsibility for conserving and protecting oceans, fisheries, as well as responsibility for issues associated with navigation and for inter-governmental and international affairs. Typically, federal environmental laws are designed to apply to the nation as a whole. There are numerous federal statutes that govern aspects of environmental protection, including the *Canadian Environmental Protection Act*, 1999 (CEPA), the *Canada Water Act*, the *Fisheries Act*, the *Environmental*

*Enforcement Act*, for which Environment Canada, the Department of Fisheries and Oceans and Health Canada may have enforcement responsibilities. Specifically, CEPA has EMS-related provisions: pursuant to s. 291.1, regulations pertaining to EMSs may be developed, and pursuant to s. 291.1 of the Act, the court may order the offender (Table 2):

- (e) '... to implement an EMS that meets a recognized Canadian or international standard'.
- (f) '... to have an environmental audit conducted by a person of a class and at the times specified by the

court and directing the offender to remedy any deficiencies revealed during the audit'.

For the drinking water sector, the federal government played a role in the development of national water quality rules such as the Guidelines for Canadian Drinking Water Quality, which were developed by the Federal-Provincial-Territorial Committee on Drinking Water (Health Canada website (21 December 2015), [www.hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index-eng.php](http://www.hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index-eng.php)). Such guidelines and related technical documents are used by provincial governments in the

**Table 2** | Legislation relevant to ISO 14001

Rule Instrument	Significance
<b>Canada</b>	
<i>Fisheries Act</i> 1985	Gives court authority to engage in creative sentencing powers to order implementation of ISO 14001 (s.79.2)
<i>CEPA</i> 1999	Allows for the development of regulations for the establishment of EMS (s. 209.1.a)
<i>Environmental Enforcement Act</i> 2010	Allows for enforcement tools for directing the offender to implement an EMS, PPPs, or EEPs, requiring environmental periodic audits
A protocol guide for an EMS Audit 2001	Provides detailed guidance for conducting EMS audit, based on ISO, 14001 (Environment Canada 2001)
<b>Ontario</b>	
DWQMS 2006	Requires a quality management standard for drinking water systems. Primarily based on ISO 9001 and HACCP for the food industry
EPA and OWRA	Requires sewage works site-specific permits, minimum treated water quality criteria, and standards for operation and management
<i>Municipal Act</i> 1990	Recognizes possibility for municipalities to adopt voluntary measures for accountability and transparency (2006 Act amendment)
Licensing of operators – O. Reg. 129/04 2004	Requires certification of sewer works operators with minimum requirements of training, similar to ISO 9001 and ISO 14001 competence requirements
Environmental Penalties, O. Reg. 222/07 2007	Encourages regulated persons to implement EMSs, and reduces penalties for entities having a valid 'ISO 14001 certification'
<i>Infrastructure for Jobs and Prosperity Act</i> 2015	Requires the preparation of infrastructure asset management plans Infrastructure planning should maintain ecological and biological diversity, and be resilient to the impacts of climate change
<i>Development Charges Act</i> 1997	Requires municipalities to have an asset management plan prior to passing any development charge by-laws (2015 Act amendment)
<b>Municipal</b>	
EMS for Municipal Infrastructure – Env. Protocols 2005	Provides detailed guidance based on ISO 14001, by the FCM and the Canadian National Research Council
Voluntary adoption of ISO 14001 standard for wastewater systems	Durham Region, York Region, Richmond Hill, Calgary, Halifax, Winnipeg, Alberta Capital Region Wastewater Commission, St. John's, Burnaby, Vancouver, London, Collingwood, Edmonton, Elgin Area/Lake Huron (City of London), and Regina

development of their own drinking water regulatory requirements.

For the wastewater and stormwater sector, the federal *Fisheries Act* has provisions protecting against deleterious deposits into water frequented by fish. The Wastewater Systems Effluent Regulations (WSER) (*Fisheries Act*, <http://laws-lois.justice.gc.ca/eng/regulations/SOR-2012-139/FullText.html>) passed pursuant to the *Fisheries Act* require municipalities to monitor and record daily volume of wastewater entering a wastewater treatment system or effluent discharge to the environment. Provinces are attempting to ensure that their own legislation is harmonized with WSER to avoid duplication. The need for a harmonized approach was highlighted in the Government of Canada's WSER *Regulatory Impact Analysis Statement* (RIAS) (Office of the Auditor General of Canada, Implementation status of the WSER (Online), Available: [www.oag-bvg.gc.ca/internet/English/pet\\_328\\_e\\_36429.html](http://www.oag-bvg.gc.ca/internet/English/pet_328_e_36429.html) (10 February 2016)). However, as of January 2016, no harmonized agreement has been announced for Ontario. Both, in the federal and provincial contexts, 'wastewater' means sanitary wastewater, and stormwater.

Relevant to the study of EMS is the passing of the Canadian *Environmental Enforcement Act* (2010), which introduced new enforcement tools, fine regimes, and strengthened sentencing provisions in federal environmental legislation, including CEPA. This legislation allows for orders that a judge may impose for an environmental offense, thus 'directing the offender to implement an EMS, pollution prevention plan (PPP), or environmental emergency plan (EEP)'. Other type of orders a judge might impose include 'monitoring (or paying for monitoring of) environmental effects of an activity on the resources of a marine conservation area; requiring periodic environmental audits' (Legislative Summary of Bill C-16: *Environmental Enforcement Act*. Website: [www.lop.parl.gc.ca/](http://www.lop.parl.gc.ca/)). These new enforcement tools and strengthened sentencing provisions in federal legislation represent government recognition of value of 'EMS, PPP, and EEP' (2010), as applied to any entity that is subject to Canadian environmental law, and so this would include Ontario municipalities.

In summary, relevant to the study of EMS from the context of federal legislation, the following statutes have direct reference to EMS or support use of EMSs that meet a

recognized Canadian or international standard, such as ISO 14001 (Table 2):

- The *CEPA* has provisions to allow for development of regulations for the establishment of EMS (s. 209.1.a.). As noted earlier referencing section 291.1 of the Act, and subsections 'e' and 'f'.
- The Canadian *Environmental Enforcement Act* (2010), introduced new enforcement tools, fine regimes, and strengthened sentencing provisions in federal environmental legislation, including CEPA.
- The *Fisheries Act* (1985) gives court authority to engage in creative sentencing powers that have been interpreted by the courts in ways that have included court orders for offenders to implement ISO 14001. Section 79.2 of the Act notes that the court may require an entity:

'... to comply with any other conditions that the court considers appropriate for securing the person's good conduct and for preventing the person from repeating the offence or committing other offences under this Act'.

An example pertaining to the private sector includes *R. v. Prospec Chemicals Ltd* (1996), and for municipal bodies, *R. v. the City of Calgary* (2000), and a decision concerning the Alberta Capital Region Wastewater Commission, which pleaded guilty to 2014 charges under the *Fisheries Act* s.36 for raw sewage spill into a creek draining to the Sturgeon River. The sentence included a \$20,000 fine, a \$180,000 payment to the Environmental Damages Fund, and a requirement to update their wastewater management standards, which they did through their adherence to ISO14001, and employee training (Darbyshire 2016).

- The government of Canada has created guidelines for municipalities for the voluntary adoption of EMS-type of standards. In 2001 the government published 'A protocol guide for an EMS Audit' (EC 2001).

In other jurisdictions, there has been also increasing use of international EMS for municipal wastewater systems. In the United States, in 2005, the US EPA created the Guide for Evaluating Capacity, Management, Operation, and Maintenance (CMOM) Programs at Sanitary Sewer Collection Systems, a guide that covers many of the elements of



the ISO 14001 (US EPA 2005). Several cities in North Carolina have implemented ISO 14001 for their wastewater systems (City of Gastonia 2000).

### Provincial government role

Prior to the Walkerton water crisis of 2000, the drinking water sector was regulated primarily via the Ontario *Environmental Protection Act* (EPA) 1990 and the *Ontario Water Resources Act* (OWRA) 1990. The origins of the OWRA date back to the 1950s. Under sections 34 and 52, the OWRA regulates the water takings and the approval of water works (i.e. drinking water infrastructure), respectively. Both the EPA and OWRA are administered and enforced by the Ministry of the Environment and Climate Change (MOECC).

In response to the Walkerton tragedy (2000), the government of Ontario commissioned a public inquiry led by Justice Dennis O'Connor. The Walkerton Inquiry had a two-part mandate: (1) to identify the cause(s) of the outbreak, including the role played in it by government policy practice and procedure; and (2) to provide recommendations on how government can ensure the safety of the water supply in Ontario. For Part One, Justice O'Connor attributed responsibility to both the operators of the drinking water system and the provincial regulator; the former for 'improper operating practices' and for practices 'unacceptable and contrary to MOE guidelines and directives' (O'Connor 2002a). The MOE was attributed responsibility for failing to take steps to inform the operators of MOE requirements and to require appropriate training. It was concluded that it was unacceptable for the MOE to expect small water system operators to understand the science behind chlorination without proper training and background (Wellington *et al.* 2010). Quoting O'Connor, Wellington *et al.* (2010) note that the MOE 'did not invoke any mandatory abatement measures'.

Part Two of the public inquiry had a total of 93 recommendations. In a span of six years following the Walkerton Inquiry, Ontario passed three statutes, twelve regulations and a number of guidelines, and policy tools (Appendix A, available with the online version of this paper). Justice O'Connor's recommendations advocated for a harmonized QMS for all drinking water systems in Ontario. Specifically, Justice O'Connor recommended that:

'... The Ministry of the Environment should initiate the development of a drinking water quality management standard for Ontario. Municipalities, the water industry, and other relevant stakeholders should be actively recruited to take part in the development of the standard. The water industry is recognized as an essential participant in this initiative ...' (O'Connor 2002b)

A number of contributing factors were identified by Wellington *et al.* (2010) as leading to this tragedy. Table 3 attempts to classify these contributing factors under the headings: administrative, environmental, operational/technological and regulatory. These factors were addressed by the Inquiry's recommendations and subsequently by government actions in the form of acts, regulations and guidelines. Specifically, these contributing elements are addressed in the DWQMS, and are also intrinsic elements necessary for any ISO 14001.

The DWQMS was promulgated in 2006, pursuant to the *Safe Drinking Water Act* (2002), and it alone addressed many of Justice O'Connor recommendations. For the development of the DWQMS, the MOECC and the Canadian Standard Association (CSA) played key roles (the Canadian Standard Association (now the CSA Group), created in 1919, is an independent membership-based corporation without share capital, shareholders or other owners, that is governed under the *Canada Non-for-Profit Act*. CSA develops consensus-based standards in the areas of safety, quality, and performance, as well as testing and certification of conformance to various standards that serve business, industry, government and consumers (online): [www.csagroup.org/wp-content/uploads/csa-ar14-15-en-web.pdf](http://www.csagroup.org/wp-content/uploads/csa-ar14-15-en-web.pdf)). The CSA is a private standards development body that is part of the national standards system, administered by the Standards Council of Canada (SCC), with SCC being the Canadian representative in the non-state international standards body ISO. In developing the DWQMS, the MOECC and CSA partnered with four organizations using their drinking water systems in a pilot project to test the standard. One of the pilot systems, Lake Huron Water Supply System, which at the time was privately operated, had recently integrated a quality management standard with an environmental management standard and obtained ISO 14001 certification, which helped to facilitate a seamless

**Table 3** | Contributing elements leading to the Walkerton tragedy

<b>Administrative</b>	<b>Environmental</b>
<p><b>Lack of oversight by the owner</b></p> <p>The Walkerton water system was operated by a public utilities commission (PUC), a third party contracted by the municipality. The municipality as owner of the assets and financially responsible for capital management, had little knowledge of operations and challenges. They had a hands-off approach</p>	<p><b>Lack of source water protection</b></p> <p>The well that caused the tragedy was vulnerable to surface water pollution from adjacent farms; compounded with the highly fractured bedrock and water penetration through rock fissures. PUC did not implement any explicit measures for source water protection; moreover, the municipality did not have the legal power to control land use on the adjacent farm</p>
<b>Operational/Technological</b>	<b>Regulatory</b>
<p><b>Lack of water quality data management</b></p> <p>The source of Walkerton's water supply was groundwater controlled by a Supervisory Control and Data Acquisition (SCADA) system, which monitored pumping rates, but did not provide any information on water quality</p> <p><b>Lack of training to operators</b></p> <p>The Walkerton operators obtained their operator licenses as part of a voluntary 'grandparenting' program in 1988, not having to take any courses or any examinations</p> <p><b>Lack of monitoring of chlorination and turbidity</b></p> <p>1994 rules under the Ontario Drinking Water Objectives for continuing monitoring were applicable to Walkerton; however, those rules applied to new wells only. Those wells approved under previous regimes were grandfathered and there was no program to review them</p> <p><b>Mislabelling of samples</b></p> <p>Samples taken were routinely mislabelled and therefore unreliable</p>	<p><b>Obsolete environmental protection legislation</b></p> <p>Drinking water regulations (e.g. OWRA) dated back to 1950s, with no regulations for agricultural practices, left responsibility for regulating, approving, and inspecting water works with the MOE, i.e. little responsibility transferred to the municipalities</p> <p><b>Lack of funding and privatization of water labs</b></p> <p>In 1995, the provincial government privatized water testing (attributable to a need for budget reductions) without regulations that would have required private labs to notify the MOE and the Medical Officer of Health of adverse test results</p> <p><b>Lack of follow up to inspection reports</b></p> <p>Although as early as 1992, 1995 and 1998 inspection reports from the MOE had noted concerns with the bacteriological quality monitoring, no abatement actions were enforced by the MOE</p> <p><b>Impacts of government cutbacks</b></p> <p>A number of budget cuts to the MOE between 1994 and 2000 reduced its environmental staff by 30%, limiting its capacity for inspections, abatement and enforcement</p>

implementation of the new DWQMS (York Region 2004; City of London 2008).

The DWQMS provided a blended approach that combined the underlying principles of ISO 9001 (QMS), and the 1997 Hazard Analysis and Critical Control Points related to food products (HACCP). The HACCP basic criteria is built on a solid foundation of pre-requisite programs, with the recommendation that all pre-requisite programs should be assessed during the design stage and should be regularly audited thereafter (U.S. Food and Drug Administration 2015). For the development of the DWQMS, the design of the standard combined the underlying principles of HACCP (such as critical control points) with the preventative maintenance procedures for processing equipment to avoid unexpected equipment failure and loss of production. This practice has been documented in many jurisdictions (Damikouka *et al.* 2007).

The DWQMS is part of the provincial Municipal Drinking Water Licensing regime. In order to obtain a MDW licence, among other licence application requirements, municipalities are required to have an Operational Plan (quality manual) prepared in accordance with the DWQMS and an accredited operating authority. The accredited operating authority is an underlying principle to satisfy the owner's responsibilities of due diligence and standard of care.

Parallel to the Walkerton Inquiry there were criminal investigations relative to the seven deaths in Walkerton. This investigation resulted in the conviction of the operators (*R. v. Koebel and Koebel*), with a one-year prison sentence being imposed on the first operator and a conditional six-month sentence for the second (Wellington *et al.* 2010). A class action lawsuit was also launched in 2000 (Smith

*v. Brockton*), in the Ontario Superior Court of Justice, resulting in the Walkerton Compensation Plan. In the settlement agreement, the province admitted no liability but guaranteed the compensation plan, paying out at least \$2,000 to every person affected by the *E. coli* outbreak, with all higher claims to be assessed individually, with no cap. This precedent setting case provided an impetus for the municipal regulated community to comply with the new legislation (Appendix A, online), and to meet its associated increased levels of due diligence under the DWQMS which drew inspiration from the management system approach embedded in ISO 9001, ISO 14001, and HACCP.

Municipal and industrial wastewater and stormwater works are regulated under the EPA and OWRA. Additional policy tools include guidelines and manuals such as: the Provincial Water Quality Objectives (PWQO), a set of water quality criteria considered to represent the minimum standards necessary for the protection of aquatic life and recreational water use (MOECC 1994); the Ontario Design Guidelines for Sewer Works (MOECC 2008); and the Ontario Stormwater Management Planning and Design Manual (MOECC 2003). These guidelines are voluntary and the regulated community apply best efforts to meet those guidelines. Sludge from wastewater treatment plants (WWTPs) is regulated under two acts: the EPA, and the *Nutrient Management Act*, administered by the Ministry of Natural Resources.

The Transfer of Review program established in the 1970s, is a MOECC program that transfers the technical review responsibilities to participating municipalities. Although there is no pre-approval granted by the regulator, this process streamlines the MOECC approval of new municipal sewer and stormwater pipes, and allows municipalities to collect and keep development application fees. By 2015 there were 32 municipalities subscribed to the program, a number that has remained constant since the early 2000s. Although there were attempts to promote the program in the late 1990s, there were two primary reasons why this program has not grown: first, only medium and large municipalities have the technical capacity to complete the technical review required by MOECC; and second, the Walkerton tragedy effectively shifted provincial and municipal attention to drinking water.

Recent changes to the Ontario EPA support a risk-based approach for wastewater and stormwater, transferring more responsibilities from the province to municipalities. The *Open for Business Act 2010*, allowed the MOECC to 'calibrate' their site-specific rule instruments (also known as environmental compliance approvals or ECAs) for wastewater and stormwater sectors to enable them to approve multi-media, multi-site, and introduce operational flexibility or pre-approval of new infrastructure. However, the risk-based approach has not triggered any provincial requirement of a management system for the wastewater or stormwater sectors. Since 2010, the MOECC has implemented a number of ECAs with such calibration for wastewater and stormwater facilities which closely align to the drinking water rule instruments:

For municipal wastewater:

- Durham Region's Harmony Creek Water Pollution Control Plant (2010), 1st ECA with Limited Operational Flexibility (LOF) for sewage works (MOECC 2010).
- Halton Region's Burlington Skyway wastewater system (2013), 1st System Wide ECA, which adopts most regulatory characteristics from the SDWA-water permit, including multi-site, multi-media (MOECC 2013a, 2013b).
- City of Sudbury's wastewater treatment and collection system (2014), 2nd System Wide ECA (MOECC 2014).
- City of Barrie's wastewater system (2016), 3rd System Wide ECA (MOECC 2016).

For municipal stormwater:

- South Kanata Development Corporation (2012), 1st ECA with LOF for SWM in a municipal subdivision (MOECC 2012).
- City of Barrie's SWM (2016), 1st System Wide ECA, covering the entire municipality's SWM system (MOECC 2016).

Another example of the adoption of risk-based approach by the provincial regulator was the launch in 2012 of the Environmental Activity and Sector Registry (EASR) (MOECC, EASR: [www.ontario.ca/page/environmental-activity-and-sector-registry](http://www.ontario.ca/page/environmental-activity-and-sector-registry)). This program created a streamlined approval process for business' self-registration of less complex operations. Under the program rules, activities eligible for the EASR must be done subject to a particular regulation. The O. Reg. 346/12 for heating systems and

standby power systems are used by municipalities. However, there are no EASR activities for municipal wastewater collection or stormwater works.

Relevant to the study of EMS from the context of provincial legislation, the following statutes have direct reference to EMS or specifically to the ISO 14001:

- The Environmental Penalties regulation (O. Reg. 222/07), under the Ontario EPA, which was introduced prior to the Canadian *Environmental Enforcement Act* (2010), with this regulation providing for the assessment of environmental penalties in a manner that encourages regulated persons to, among other things, implement an EMS. Section 17 of the O. Reg. 222/07, specifies provisions for reduced penalties in the event that the regulated person had in place an EMS with valid audits within three years before the contravention, and that at the time of the audit, the audit confirmed the following:

‘1. That at the time of the audit, the EMS was certified as meeting the standard set out in the document entitled “EMSs – Requirements with guidance for use” and designated as CAN/CSA-ISO 14001:04, published by the Canadian Standards Association, as amended from time to time, by an EMSs registrar that has been accredited by:

- A. the SCC, or
- B. an accreditation body outside of Canada that is a signatory to the International Accreditation Forum Multilateral Recognition Arrangement, and...

2. That at the time of the audit, the EMS was determined to be compliant with the standard set out in the document referred to in paragraph 1” by an independent auditor (who is not an employee or contractor), and according to the code of conduct as per CSA/ISO 19011:2003’.

While the Environmental Penalties regulation, O. Reg. 222/07, was enacted to penalize industries regulated under the Effluent Monitoring and Effluent Limits (i.e. mining and other industrial sectors), it demonstrates the Provincial government support for the use of ISO 14001 certification by ‘regulated persons’ as defined in the

O. Reg. 222/07 (Environmental Penalties regulation), O. Reg. 222/07, defines ‘regulated person’ as a person who owns or operates a MISA (Municipal Industrial Strategy for Abatement) or MISA-like facility). The Environmental Commissioner of Ontario supports the Environmental Penalties regulation in that it provides ‘ministry staff with a faster, less resource intensive, and less costly means of bringing contraveners into compliance with provincial environmental laws’ and it ‘may result in a reduction in the total number of cases prosecuted by MOECC’ (ECO 2008). Further, the Source Water Protection Plans approved in 2015 and 2016 by the MOECC under the SDWA and O. Reg. 284/07, reference the O. Reg. 222/07, as a way to assess environmental penalties and encourage environmental protection.

- Amendments to the *Development Charges Act* (1997), introduced in 2015, introduced requirements to municipalities to have an asset management plan prior to passing any development charge by-laws. This requirement aligns the municipal sector with requirements under the ISO 14001:2015, which requires an asset management strategy, which is an integral component of life cycle assessments.
- An amendment to the *Municipal Act* (1990), introduced in 2006 (under Bill 130) recognized the possibility of municipalities adopting voluntary measures for accountability and transparency (Section 10 (2) 2 of Part II), which is an underlining principle under ISO family of standards.

Examples of voluntary measures noted in the Act include: the appointment of an Integrity Commissioner for performing in an independent manner the municipality’s adherence to the code of conduct, procedures, rules and policies (Sections 223.3 (1) of Part V.1); and the appointment of an Ombudsman to investigate in an independent manner any decision or recommendation made or act done or omitted in the course of the administration of the municipality (Section 223.13 (1) of Part V.1). Ontario municipalities, in general, reacted negatively towards both the mandatory and voluntary policy changes. It has been suggested by *Alcantara et al. (2012)*, that municipalities tend to respond to mandatory policy change by adopting the minimum requirements set out in provincial legislation, and that ‘voluntary private standards are only adopted when similar provisions are already widely used at the local level’.



- The *Infrastructure for Jobs and Prosperity Act* (2015) requires the preparation of infrastructure asset management plans, and the infrastructure planning to maintain ecological and biological biodiversity, and resilient to the impacts of climate change – concepts which could potentially be covered as part of implementation to the ISO 14001 standard.

Another example of moving towards a risk-based approach by the MOECC is the 2016 pilot project for 'self-inspection' for low risk activities implemented with the Region of York. This project applied self-inspections of drinking water systems based on the principles of Behavioral Insights ([www.ontario.ca/page/behavioural-insights-pilot-project-license-plate-sticker-renewal](http://www.ontario.ca/page/behavioural-insights-pilot-project-license-plate-sticker-renewal)), a school of thought in behavioral science developed in the UK to support self-governance of public and private entities (Halpern 2015). The pilot project results by York Region (Khemai 2016) noted concerns on downloading more comprehensive responsibilities to municipalities without a clear policy of accountability, generating revenue, and potential liabilities.

While not in Ontario, a case worth mentioning was the case *R. v City of Calgary* (2000), where the City pleaded guilty to a charge under the Province of Alberta's EPA. The incident was a failure in the ventilation system at a water treatment plant, which resulted in the release of 160 kg of chlorine gas into the atmosphere. Under the terms of the sentence, the City was fined \$1,000 and received a creative sentence which committed the City to obtain ISO 14001 certification for its Bears paw and Glenmore water treatment plants by August 2003, and to making a presentation on the incident to the Western Canada Water and Wastewater Association annual meeting in October 2001 (Ecolog 2000).

### Municipal government role

Ontario's municipalities are government entities created by the provincial government, and therefore are subordinate to provincial legislative and regulatory requirements. The *Municipal Act* is the main statute governing the creation, administration and governance of municipalities. There are complex rules concerning what municipalities may do, and how they may do it. Municipalities are required to comply with minimum requirements set by the province, but municipalities may adopt higher than minimum standards due

to complex political, environmental, public opinion, and other issues.

Under provincial legislation (i.e. SDWA, EPA, and OWRA), municipalities are 'owners' of water, and wastewater systems, and have the key responsibilities for planning, developing and implementing drinking water, wastewater and stormwater systems. Through municipal by-laws, they can also require additional requirements within their boundaries. It is standard practice for municipalities to adopt international, Canadian, and provincial standards for developing their own by-laws (*Municipal Act*, 2015. Part II, Section 10 (2). Website (9 January 2016): [www.ontario.ca/laws/statute/01m25](http://www.ontario.ca/laws/statute/01m25)). Examples of international standards include: the American Water Works Association (AWWA) standards (AWWA Website (22 December 2015): [www.awwa.org/publications/standards.aspx](http://www.awwa.org/publications/standards.aspx)) for water quality, water pipes, disinfection; the Ten State Standards (Ten States Standards is a voluntary organization established in 1950, by public health and environmental managers from the US states around the Great Lakes-Upper Mississippi watershed and the Province of Ontario (Online): <http://10statesstandards.com/>). This standard concern water and wastewater works design and practice, and it is widely use and adopted for the design of municipal water and wastewater infrastructure); European standards for water re-use (EC Guidelines for Water Reuse (22 December 2015): <https://ec.europa.eu/jrc/en/news/guidelines-better-water-reuse-europe>), etc.

The experience afforded by the DWQMS has led a handful of municipalities to proactively adopt the ISO 14001 for the wastewater and stormwater systems. There are four municipalities in Ontario that have ISO 14001 certifications for either water or wastewater systems: York Region (2001); Richmond Hill (2006); Collingwood (2007); Erin Area/Lake Huron (water supply to the City of London) (2006); and Durham Region (2006). This is a small number considering that there are 444 municipalities in Ontario (Ministry of Municipal Affairs and Housing. Website (9 January 2016): [www.mah.gov.on.ca/page1591.aspx](http://www.mah.gov.on.ca/page1591.aspx)), but in terms of population it currently represents approximately 2.7 million people, or 20% of the province. Other early adopters in Canada include: City of Calgary (2002), City of Edmonton (2004), Regina (2014), Halifax Water (2014), Winnipeg (2004), St. John's, Burnaby, Vancouver, etc.



As reported at a conference with the Municipal Water and Wastewater Regulatory Committee (the NWWRC is an independent forum formed in 2007 by Ontario municipalities on a voluntary basis with the purpose of having information exchange and mutual support for the implementation of the DWQMS), there are four municipalities developing EMS pursuant to ISO 14001: Halton Region, City of Toronto, Region of Peel, and the City of Barrie. These municipalities have an estimated 4.8 million people or 37% of Ontario's population. Combining both municipalities with ISO 14001 and those developing EMS, this represents 67% of Ontario's population, and therefore their EMS adoption is likely to have an effect on the remaining municipalities and other provinces in the near future.

A relevant case of a municipality pursuing ISO 14001 was the City of Ottawa. In 2006 and 2007, the City of Ottawa had two raw sewage spill incidents. This was known as 'sewergate', with an estimated 1 million cubic meters draining to the Ottawa River, and odour emissions associated with a pumping station in the community of Richmond, southwest of Ottawa. In response to the strong reaction in public opinion, the City of Ottawa adopted many elements of the ISO 14001 by their wastewater management team (Reevelly 2008). While Ottawa implemented many of ISO 14001 elements, they did not obtain certification.

At the national level, in 2005 the Federation of Canadian Municipalities (FCM), in partnership with the Canadian National Research Council, published the 'EMSS for Municipal Infrastructure – Environmental Protocols' (FCM/NRC 2005), based on the ISO 14001 standard (established in 1901, the FCM is a national organization representing municipal governments across the country including Canada's largest cities, small urban and rural communities and 20 provincial and territorial municipal associations (online): [www.fcm.ca/home/about-us.htm](http://www.fcm.ca/home/about-us.htm)). The FCM Protocol noted that 'at the time of writing, eight municipalities had established an EMS consistent with ISO 14001 and had received certification by an accredited third-party registrar ... and one corporation as a whole, registered to ISO 14001. In addition, nine other municipalities are also developing an ISO 14001-based EMS, and another five municipalities are considering the development of an EMS'.

## ENVIRONMENTAL POLICY CONVERGENCE

This article adopts the conception of policy convergence articulated by Lenschow *et al.* (2005), where policy convergence is said to be likely to occur in jurisdictions with similar culture, institutions and economy that adopt similar policy 'goals and ideas of a policy, the instruments applied, or the setting or the 'calibration' of these instruments'. We have suggested that policy convergence is occurring in two different dimensions: across the federal, provincial and municipal levels of government, and between public and private sectors.

It is important to differentiate policy convergence from *policy diffusion*, *policy transfer*, and *policy learning*. Policy convergence differs from *policy diffusion*, in that policy settings such as globalization, economy, institutions, administration, culture, and other policy issues affect the rate of diffusion and transfer of policies and do not necessarily transcend jurisdictional boundaries. As stated by Lenschow, 'policy diffusion does not automatically lead to convergence as foreign models are likely to be changed to fit national institutional structures and policy styles', in a multiple angle view from many jurisdictions (DeLeon & Resnick-Terry 1999; Lenschow *et al.* 2005). It differs from *policy learning* in that the literature commonly applies *policy learning* to intergovernmental diffusion processes from the receiver country perspective, in one direct angle from one country to another. It also differs with *policy transfer*, in that *policy transfer* borders with mechanisms of coercion and multi-lateral cooperation where policies may be forced as conditions for economic incentives. In summary, in the Ontario context, policy diffusion, policy transfer and policy learning are of less relevance since the phenomenon is occurring within the same national jurisdiction, with minimum influence from other countries, and certainly there is no coercion or multi-lateral influence. For the purposes of this article, we are referring to a situation where there is policy convergence among federal, provincial and municipal governments in the same (Canadian) context, in the sense that all three levels of government are increasingly referencing and using ISO 14001, a private standard, as part of their governance approach.

Much of the theory of policy convergence in the academic literature refers to globalization, international trade,

and how the international and cross-national contexts play a factor in it (Lieberink *et al.* 2014). The idea of public and private governance systems operating in a largely overlapping or mutually reinforcing way has been discussed by scholars examining state-based and private EMS certifications. There is literature critically assessing and debating the salutary and beneficial aspects of environmental management voluntary initiatives (Dahlström *et al.* 2003; Arimura *et al.* 2008; Chatterji & Toffel 2010; Simpson & Sroufe 2014). With respect to the auto sector, some scholars have concluded that ISO 14001 or EMAS (the European equivalent of ISO 14001) is largely ineffective in improving compliance with environmental regulations because regulatory requirements already address these issues (Dahlström *et al.* 2003). Other studies suggest that state-based EMSs are unlikely to promote constant improvement unless those regulations are modified and made stricter over time (Arimura *et al.* 2008). The risk posed by a stagnant EMS, either state-based or private, is the lack of incentive for innovation, and the flaw that some authors suggest exists in management standards is that they inadvertently discourage diversity of environmental management practices by encouraging a 'going by the book' compliant behaviour (Chatterji & Toffel 2010; Simpson & Sroufe 2014). The underlying risk is that certified corporations will support innovation and diversity only when they receive a poor rating, or when an external actor or issue forces them to act.

In addition to the convergence on the provincial regulatory approaches through rule instruments and site-specific approvals, we have seen that the courts are providing directly or indirectly another impetus for policy convergence in the form of:

- Incorporation of private standards as component of judicial sentencing options, provided for through legislation, i.e. there is an increasing federal and provincial legislation specifically referring to ISO 14001-type of certification or elements therein.
- Reliance upon private standards as an element of penalty assessment, provided for through legislation, i.e. increasing federal and provincial court rulings which include 'creative sentencing' (Wood & Johansson 2008; Saxe 2011, 2012), where EMS are notoriously a component of

the sentence, e.g. Darbyshire (2016); *R. v. Prospec Chemicals Ltd.* (1996), and *R. v. City of Calgary* (2000).

- A mechanism proactively adopted by corporations to increase a due diligence defense in case of environmental violations; and as a business practice to attract government contracts.

The DWQMS and regulation was intended to provide minimum standards, which are now being surpassed by municipalities adopting industry's BMPs. It has been reported that dozens of municipalities in Canada already have systems in place to optimize their asset management with life cycle analysis, infrastructure sustainability plans (e.g. climate change and other pressing factors), that go beyond regulatory requirements (Wong 2013).

As noted earlier, changes on the Ontario EPA under the Open for Business Act (2010), and EASR legislation since 2012, support a risk-based approach for wastewater and stormwater for both municipal and industrial (see Provincial government role section). Through these changes, legislation for wastewater and stormwater is being 'calibrated' to mirror that of the drinking water more modern framework. Elements that allow pre-approval, system-wide approaches, and multi-media is now part of the municipal (and industrial) wastewater and stormwater provincial regulatory framework.

In North America, at the federal level, both the governments of Canada and the United States have created guidelines for municipalities for the voluntary adoption of EMS-type of standards. In Canada, in 2001 the government published a protocol guide for an EMS Audit (EC 2001). In the United States, in 2005, the US EPA created the Guide for Evaluating Capacity, Management, Operation, and Maintenance (CMOM) Programs at Sanitary Sewer Collection Systems, a guide that covers many of the elements of the ISO 14001.

## CONCLUSIONS

This article has explored the policy convergence of environmental protection approaches for the Ontario MDW, wastewater and stormwater sectors, and the role that QMS and EMS are playing in fostering such convergence. The

Walkerton tragedy (2000) provided the impetus for the development of a QMS approach for drinking water, and the introduction of ISO 14001 in 1996 provided an important impetus for widespread use of EMSs by municipal governments. Four conclusions are drawn from this study:

1. There is an increasing policy convergence in the governance of Ontario MDW, wastewater and stormwater sectors in the form of adopting risk-based management systems approaches that draw on private (non-state) rule instruments, and this policy convergence is reinforced by direct and indirect references at the federal, provincial and municipal level to management systems standards in law and the courts, policy and in practice.

The drinking water regulatory framework that was developed in response to the Walkerton tragedy is intended to address a number of factors (Appendix A, online). A risk-based approach was adopted by enacting a number of statutes and regulations that had the effect of transferring many responsibilities from the Province of Ontario to the municipalities, and also incorporated a QMS that required municipalities to have a management system drawing on the private ISO 9001 and HACCP standards. The responsibilities transferred to municipalities included the streamlining of drinking water municipal approvals (self-approvals for minor modifications and expansions), replacing thousands of discrete site-specific approvals with one single rule instrument that incorporated pre-approval of low risk activities, multi-site approvals, multi-media, and operational flexibility (i.e. the Drinking Water Permit). The combined effect resulted in use of municipality self-audits, external audits, and implementation of the DWQMS.

The wastewater and stormwater regulatory framework remained largely subject to the older, pre-Walkerton OWRA regime established in the 1950s, with minor revisions sparked by the Walkerton inquiry (e.g. O. Reg. 129/04 for licensed operators). Especially since the *Open for Business Act* 2010, the adoption of risk-based approaches appears to be 'calibrating' the discrete, site specific ECAs for municipal wastewater and stormwater, with similar streamlining of approvals, and the replacement of thousands of multiple site-specific ECAs with one System Wide ECA (e.g. LOF, EASR, System wide ECA).

Private (non-state) regulatory instruments (such as ISO QMS and EMS standards) are creating a form of conceptual 'bridge' between public and private forms of regulation. There is an increasing reference to international and national EMS standards by legislation and in regulatory enforcement, where Canadian courts are providing an impetus for policy convergence between the three levels of government, towards the use of EMS standards.

2. For some time now, municipalities have been proactively adopting and/or incorporating important elements of quality and EMSs, primarily from ISO 9001 and ISO 14001, into their governance structure.

In anticipation of the introduction of the DWQMS, some municipalities proactively adopted a QMS and/or EMS for their water and wastewater systems (i.e. Durham Region, Richmond Hill, York Region, Collingwood, and London). More recently, a number of Ontario municipalities have indicated their intention to adopt an EMS approach to the management platform for their wastewater and stormwater systems (e.g. Halton Region, Peel Region, Toronto, Barrie).

Based on our review, the use of ISO-type management system standards by municipalities can be characterized as useful supplements to wastewater and stormwater regulations, but do not supplant or substitute the conventional regulations in place. Relatively little research has been conducted on how QMS and EMS are affecting the environmental performance of drinking water/wastewater/stormwater systems. However, reports from the Ontario's drinking water Chief Drinking Water Inspector suggest that the multi-barrier approach built through regulations including the DWQMS, are providing a robust system with minimum number of significant water quality incidents (MOECC 2016).

The Ontario drinking water quality management standard and regulation was intended to provide minimum standards, which are now being surpassed by municipalities adopting BMPs, primarily drawing from international standards (such as ISO 14001). Elements from these non-state standards include asset management, life cycle assessment, risk management, emergency preparedness, root cause analysis, and others, all of which are intrinsic to the ISO management

approach. Thus, even without a legislative requirement, Ontario municipalities are moving towards implementation of some elements of EMS standards. Outside of Ontario, a number of Canadian municipalities are also using ISO 14001 EMS systems in their water management (e.g. Halifax, Vancouver, Burnaby, Calgary, and Edmonton).

- Canadian organizations are increasingly being directly or indirectly encouraged by laws, and courts decisions to adopt EMSs and in some cases, specifically to implement ISO 14001 certifications.

Judicial sentencing applying to both municipal governments and private corporations, along with specific references to EMSs in federal and provincial legislation, signal court support for municipalities to adopt an EMS approach, including in the specific form articulated in international standard such as ISO 14001. Recent federal and provincial legislation refers to EMSs, standards, or elements therein, including in some cases specific references to ISO 14001 (see Table 2). In this way, laws and the courts are providing an impetus for policy convergence in the form of support for use of formal EMSs by regulated actors including municipalities.

Judicial use of non-state EMS standards as part of 'creative sentencing' (Saxe 2011, 2012) is not uncommon, as is the case in Alberta Capital Region Wastewater Commission adopting an EMS based on ISO 14001 (Darbyshire 2016); *R. v. Prospec Chemicals Ltd* (1996), and *R. v. City of Calgary* (2000). Provinces are increasingly using administrative tools to direct environmental offenders to address specific pollution incidents. A notable example is the City of Winnipeg, where a Manitoba Public Hearing Report completed for the Manitoba Clean Environment Commission, mandated an EMS in response to a spill of raw sewage by the City of Winnipeg into the Red River in 2002 (Duguid 2003).

- Given that the major impacts of wastewater and stormwater are environmental in nature, an EMS standard such as ISO 14001 is best suited to be the foundation for any wastewater or stormwater management standard for Ontario, rather than a QMS standard.

Municipal wastewater and stormwater systems in Ontario, Canada, and in other jurisdictions (see Table 1, FCM, Municipal role section) have adopted

ISO 14001 rather than ISO 9001 as the best suited standard. Now that ten years have passed since the introduction of the provincially required DWQMS in 2006, a critical mass of knowledge has developed among municipal governments, with the effect that they now seem to be proactively transferring that knowledge to the wastewater and stormwater sectors and are choosing ISO 14001 (EMS) as their preferred choice for wastewater and stormwater systems.

The experience afforded by the DWQMS has led a handful of municipalities to proactively expand that knowledge base to the wastewater and stormwater sectors (e.g. Toronto, Halton Region, Peel Region, Barrie), with the focus being on EMS rather than QMS. While the DWQMS is primarily focusing on good quality drinking water, the environmental risks and impacts are left to a voluntary adoption as continual improvements under the DWQMS. To address environmental impacts, for Ontario and other jurisdictions, the EMS has been the most popular standard either mandated through the legal system, or by voluntary adoption.

In terms of future research, while this article has attempted to articulate the case for policy convergence around use of QMS and EMS by Ontario municipalities, further analysis is required to better understand such issues as: the motivations for municipalities to adopt, expand, or drop some ISO certifications; and the strengths, limitations of the DWQMS approach. A question that remains to be answered is whether a case can be made for establishing a provincially required Wastewater and Stormwater Management Standard aligned with ISO 14001, to parallel the DWQMS.

## REFERENCES

- Abouchar, J. 2003 Walkerton: its impact on groundwater protection law in Canada. *ELR* 33 (7), 10514–10521.
- Alcantara, C., Leone, R. & Spicer, Z. 2012 Responding to policy change from above: municipal accountability and transparency regimes in Ontario. *J. Can. Stud.* 46 (1), 112–137.
- Alvarez-Garcia, J. & RioRama, M. 2016 Sustainability and EMAS: impact of motivations and barriers on the perceived benefits from the adoption of standards. *Sustainability* 8 (10), 1–18.



- Arimura, T. H., Hibiki, A. & Katayama, H. 2008 Is a voluntary approach an effective environmental policy instrument? A case for environmental management systems. *J. Environ. Econ. Manage.* **55**, 281–295.
- Brubaker, E. 2003 *Revisiting Water and Wastewater Utility Privatization*. Government of Ontario Panel on the Role of Government, Faculty of Law, University of Toronto, October 3, 2003, (online), available from: [www.probeinternational.org/envirowaterarticles/revistingutilityprivatization.pdf](http://www.probeinternational.org/envirowaterarticles/revistingutilityprivatization.pdf) (accessed 16 January 2017).
- Chatterji, A. K. & Toffel, M. W. 2010 How firms respond to being rated. *Strateg. Manage. J.* **31** (9), 917–945.
- City of Gastonia 2000 *Wastewater Treatment ISO 14001 Environmental Management System Manual*. North Carolina, (Online), available from: <http://infohouse.p2ric.org/ref/13/12200.pdf> (accessed 09 May 2017).
- City of London 2008 Regional water boards receive Ontario Public Works Association awards – staff report of January 28, 2008, (Online), available from: <http://council.london.ca/meetings/Archives/Agendas/Environment%20and%20Transportation%20Committee%20Agendas/ETC%20Agendas%202008/2008-01-28%20Agenda/item%201.pdf> (accessed 15 November 2015)..
- Dahlström, K., Howes, C., Leinster, P. & Skea, J. 2003 Environmental management systems and company performance: assessing the case for extending risk-based regulation. *Eur. Environ. J.* **13**, 187–203.
- Damikouka, I., Katsiri, A. & Tzia, C. 2007 Application of HACCP principles in drinking water treatment. *Desal. J.* **210** (1), 138–145.
- Darbyshire, M. 2016 Gibbons Pump Station Bypass – Our experience with a Fisheries Act violation. In: *Presentation at the CWWA National Water and Wastewater Conference*, November 2016, Ontario, Toronto.
- Darnall, N. & Sides, S. 2008 Assessing the performance of voluntary environmental programs: does certification matter? *Policy Stud. J.* **36** (1), 95–117.
- Darnall, N., Potoski, M. & Prakash, A. 2010 Sponsorship matters: assessing business participation in government- and industry-sponsored voluntary environmental programs. *J. Public Admin. Res. Theory* **20** (2), 283–307.
- DeLeon, P. & Resnick-Terry, P. 1999 Comparative policy analysis: déjà vu all over again? *J. Comp. Policy Anal. Res. Pract.* **1** (1), 9–22.
- Delmas, M. & Montiel, I. 2008 The diffusion of voluntary international management standards: responsible care, ISO 9000, and ISO 14001 in the chemical industry. *Policy Stud. J.* **36** (1), 65–93.
- Duguid, T. 2003 *Better Treatment – Taking Action to Improve Water Quality – Report on Public Hearings for the City of Winnipeg Wastewater Collection and Treatment System*. Manitoba Clean Environment Commission, Manitoba, Winnipeg.
- Ecolog Network 2000 *The City of Calgary was Fined and Pleaded Guilty to Environmental Offenses*, Ecoweek, September 2000 (online) available from: [www.ecoweek.ca/issues/ISarticle.asp?aid=1000184595](http://www.ecoweek.ca/issues/ISarticle.asp?aid=1000184595) (accessed 04 February 2017).
- Environment and Climate Change Canada (ECCC) 2015 *Water Governance & Legislation, Provincial/Territorial, Shared Responsibility* (online) available from: [www.ec.gc.ca/eau-water/default.asp?lang=En&n=24C5BD18-1](http://www.ec.gc.ca/eau-water/default.asp?lang=En&n=24C5BD18-1) (accessed 21 December 2015).
- Environment Canada 2001 *A Protocol Guide for an Environmental Management System Audit*, ISBN 0-662-31019-5. Ottawa, Ontario (online) available from: <http://publications.gc.ca/site/eng/104414/publication.html> (accessed 21 December 2016).
- Environmental Commissioner of Ontario (ECO) 2008 Environmental Penalty Regulations. *Getting to K(No)w, ECO Annual Report, 2007–08*. Environmental Commissioner of Ontario, Toronto, ON, pp. 98–102, (Online), available from: [http://www.ecoissues.ca/MOE%27s\\_Environmental\\_Penalty\\_Regulations#ECO\\_Comment](http://www.ecoissues.ca/MOE%27s_Environmental_Penalty_Regulations#ECO_Comment) (accessed 08 February 2016).
- Federation of Canadian Municipalities and National Research Council (FCM/NRC) 2005 *Environmental Management Systems for Municipal Infrastructure* (online) available from: [www.fcm.ca/Documents/reports/Infraguide/Environmental\\_Management\\_Systems\\_for\\_Municipal\\_Infrastructure\\_EN.pdf](http://www.fcm.ca/Documents/reports/Infraguide/Environmental_Management_Systems_for_Municipal_Infrastructure_EN.pdf) (accessed 10 December 2016).
- Fulponi, L. 2006 Private voluntary standards in the food system: the perspective of major food retailers in OECD countries. *Food Policy* **31** (1), 1–13.
- Greenbaum, A. & Wellington, A. 2010 *Environmental Law and Policy in the Canadian Context*. Captus Press, Concord, Ontario.
- Halifax Water 2017 *Lake Major Water Supply Plant New Standby Power System – Tender Document*. Procurement Services, Halifax Regional Water Commission, Halifax.
- Halley, P. & Boiral, O. 2009 Les systèmes de gestion environnementale au Canada: enjeux et implications pour les politiques publiques de l'environnement. *McGill Law J.* **53** (4), 649–685.
- Halpern, D. 2015 *Inside the Nudge Unit – How Small Changes can Make A Big Difference*. WH Allen – Penguin Random House, London.
- Hart, S. L. & Milstein, M. B. 2003 Creating sustainable value. *Acad. Manag. Exec.* **17** (2), 56–69.
- Henriques, I. & Sadorsky, P. 2008 Voluntary environmental programs: a Canadian perspective. *Policy Stud. J.* **36** (1), 143–166.
- Hrudey, S. E., Huck, P. M., Payment, P., Gillham, R. W. & Hrudey, E. J. 2002 Walkerton: lessons learned in comparison with waterborne outbreaks in the developed world. *J. Environ. Eng. Sci.* **1**, 397–407.
- Ionascu, M., Ionascu, I., Sacarin, M. & Minu, M. 2017 Exploring the impact of ISO 9001, ISO 14001, and OHSAS 1801 certification on financial performance: the case of companies listed on the Bucharest stock exchange. *Bucharest Acad. Econ. Stud.* **19** (44), 166–180.



- ISO 2015 *Structure and Governance*. ISO Website (online), available from: [www.iso.org/iso/home/about/about\\_governance.htm](http://www.iso.org/iso/home/about/about_governance.htm) (accessed 15 November 2015).
- ISO 14001 2015a *The Newly Revised ISO 14001 is Here*. ISO Website (online), available from: [www.iso.org/iso/home/news\\_index/news\\_archive/news.htm?refid=Ref1999](http://www.iso.org/iso/home/news_index/news_archive/news.htm?refid=Ref1999) (accessed 17 October 2015).
- ISO 14001 2015b *Environmental Management System Standard*. ISO, Switzerland.
- Ivanova, A., Gray, J. & Sinha, K. 2014 *Towards a unifying theory of management standard implementation: the case of ISO 9001/ISO 14001*. *Int. J. Oper. Product. Manage.* **34** (10), 1269–1306.
- Kafetzopoulos, D. P. & Psomas, E. L. 2015 *The impact of quality management systems on the performance of manufacturing firms*. *Int. J. Qual. Reliab. Manage.* **32** (4), 381–399.
- Khemai, J. 2016 *Self-inspection of Drinking Water Systems – A Pilot Project Between MOECC and York Region*. Newmarket, Ontario.
- Kollman, K. & Prakash, A. 2002 *EMS-based environmental regimes as club goods: examining variations in firm-level adoption of ISO 14001 and EMAS in U.K., U.S. and Germany*. *Policy Sci.* **35**, 43–67.
- Leehane, N. 2015 *ISO 14001: 2015 – Benefits of the new Standard*. BSI website (online), available from: [www.bsigroup.com/en-GB/iso-14001-environmental-management/ISO-14001-revision-new/](http://www.bsigroup.com/en-GB/iso-14001-environmental-management/ISO-14001-revision-new/) (accessed 18 Nov 2015).
- Lenschow, A., Liefierink, D. & Veenman, S. 2005 *When the birds sing: a framework for analysing domestic factors behind policy convergence*. *J. Eur. Public Policy* **12** (5), 797–816.
- Liefierink, D., Jörgens, H. & Lenschow, A. 2014 *Understanding Environmental Policy Convergence, The Power of Words, Rules and Money*. Cambridge University Press, Cambridge.
- Martincic, C. 1997 *The ISO 14000 Series of Standards – A Brief History of ISO (Online)*, available from: [www.sis.pitt.edu/mbsclass/standards/martincic/iso14000.htm](http://www.sis.pitt.edu/mbsclass/standards/martincic/iso14000.htm) (accessed 12 November 2015).
- Ministry of the Environment and Climate Change (MOECC) 2014 *Minister's Annual Report on Drinking Water 2014*. MOECC, Toronto.
- MOECC 1994 *Water Management Policies, Guidelines – Provincial Water Quality Objectives*. Ontario MOECC, Ontario.
- MOECC 2003 *Ontario Stormwater Management Planning and Design Manual*. MOECC, Toronto.
- MOECC 2008 *Ontario Design Guidelines for Sewer Works*. MOECC, Toronto.
- MOECC 2010 *Environmental Compliance Approval 7829-888JGN, Harmony Creek Water Pollution Control Plant, Durham Region*, MOECC, issued December 20, 2010 (online), available from: [www.accessenvironment.ene.gov.on.ca/instruments/8886-882REB-14.pdf](http://www.accessenvironment.ene.gov.on.ca/instruments/8886-882REB-14.pdf) (accessed 02 January 2017).
- MOECC 2012 *Environmental Compliance Approval 3274-SRGPZB, Monahan Landing Subdivision, South Kanata Development Corporation*, MOECC, issued April 5, 2012 (online), available from: [www.accessenvironment.ene.gov.on.ca/instruments/9344-8PCRN5-14.pdf](http://www.accessenvironment.ene.gov.on.ca/instruments/9344-8PCRN5-14.pdf) (accessed 02 January 2017).
- MOECC 2013a *Environmental Compliance Approval 1545-9B7PT7, The Burlington-Skyway Wastewater Treatment Plant, Regional Municipality of Halton*, issued November 22, 2013, (online), available from: [www.accessenvironment.ene.gov.on.ca/instruments/5456-9ATRJT-14.pdf](http://www.accessenvironment.ene.gov.on.ca/instruments/5456-9ATRJT-14.pdf) (accessed 02 January 2017).
- MOECC 2013b *Environmental Compliance Approval 2401-9BFRGH, The Sewage Collection System Servicing the Burlington-Skyway Wastewater Treatment Plant, Regional Municipality of Halton*, issued November 22, 2013 (online), available from: [www.accessenvironment.ene.gov.on.ca/instruments/3078-9ATRLY-14.pdf](http://www.accessenvironment.ene.gov.on.ca/instruments/3078-9ATRLY-14.pdf) (accessed 02 January 2017).
- MOECC 2014 *Environmental Compliance Approval 1978-9CXJL (2014) The Sudbury Wastewater Treatment Plant and Sewage Collection System, The City of Sudbury*, issued May 27, 2014 (online), available from: [www.accessenvironment.ene.gov.on.ca/instruments/8038-9CHLLR-14.pdf](http://www.accessenvironment.ene.gov.on.ca/instruments/8038-9CHLLR-14.pdf) (accessed 02 January 2017).
- MOECC 2016 *2015–2016 Chief Drinking Water Inspector Annual Report, Nov 2016, Ontario: Ontario MOECC* (online), available from: <https://news.ontario.ca/ene/en/2016/11/ontarios-drinking-water-remains-among-best-protected-in-the-world.html> (accessed 10 December 2016).
- Nichols, A. W. 2013 *Exploring the Myths Surrounding ISO9000: A Practical Implementation Guide*. IT Governance Publishing, Cambridgeshire.
- O'Connor, D. R. (The Honorable Dennis R. O'Connor) 2002a *Part One of the Report of the Walkerton Inquiry, Ministry of the Attorney General* (online), available from: [www.attorneygeneral.jus.gov.on.ca/english/about/pubs/walkerton/part1/](http://www.attorneygeneral.jus.gov.on.ca/english/about/pubs/walkerton/part1/) (accessed 12 November 2015).
- O'Connor, D. R. (The Honorable Dennis R. O'Connor) 2002b *Part Two of the Report of the Walkerton Inquiry – A Strategy for Safe Drinking Water, Ministry of the Attorney General* (online), available from: [www.attorneygeneral.jus.gov.on.ca/english/about/pubs/walkerton/part2/](http://www.attorneygeneral.jus.gov.on.ca/english/about/pubs/walkerton/part2/) (accessed 12 November 2015).
- Psomas, E. L., Fotopoulos, C. V. & Kafetzopoulos, D. P. 2011 *Motives, difficulties and benefits in implementing the ISO 14001 environmental management system*. *Manage. Environ. Qual. Int. J.* **22** (4), 502–521.
- Reevelly, D. 2008 *The Mayor Declares War to City Staff, Ottawa Citizen*, May 27, 2008 (online), available from: <http://ottawacitizen.com/news/local-news/the-mayor-declares-war-on-city-staff> (accessed 05 February 2017).
- Saxe, D. 2011 *WSER Legal Perspectives, Canadian Water and Wastewater Association (CWWA)*, November 25, 2011 (online), available from: [http://envirolaw.com/wp-content/uploads/CCWA\\_Nov25-for-posting.pdf](http://envirolaw.com/wp-content/uploads/CCWA_Nov25-for-posting.pdf) (accessed 15 April 2016).
- Saxe, D. 2012 *Creative Sentencing – Brilliant or Cheap?* Siskind Environmental Law, May 1, 2012 (online), available from:

- [www.siskinds.com/envirolaw/creative-sentencing/](http://www.siskinds.com/envirolaw/creative-sentencing/) (accessed 11 December 2016).
- Searcy, C., Morali, O. & Karapetrovic, S. 2012 *An analysis of ISO 14001 and suggested improvements*. *J. Glob. Responsib.* 2 (2), 278–293.
- Simpson, D. & Sroufe, R. 2014 *Stakeholders, reward expectations and firms' use of the ISO14001 management standard*. *Int. J. Oper. Prod. Manage.* 34 (7), 830–852.
- U.S. Food and Drug Administration 2015 *Hazard Analysis Critical Control Point – HACCP Principles and Application Guidelines*, FDA Website (online), available from: [www.fda.gov/Food/GuidanceRegulation/HACCP/](http://www.fda.gov/Food/GuidanceRegulation/HACCP/) (accessed 18 November 2015).
- US EPA 2005 *Guide for Evaluating Capacity, Management, Operation, and Maintenance (CMOM) Programs at Sanitary Sewer Collection Systems* (online), available from: [www3.epa.gov/nepdes/pubs/cmom\\_guide\\_for\\_collection\\_systems.pdf](http://www3.epa.gov/nepdes/pubs/cmom_guide_for_collection_systems.pdf) (accessed 2 January 2017).
- Webb, K. 2004 Understanding the voluntary codes phenomenon. In: *Voluntary Codes: Private Governance, the Public Interest and Innovation* (K. Webb, ed.). Carleton University Research Unit for Science and Innovation, Ottawa, pp. 3–31.
- Webb, K. 2005 Sustainable governance in the twenty first century: Moving beyond instrument choice. In: *Designing Government: from Instruments to Governance* (P. Elias, M. Hill & M. Howlett, eds). McGill-Queen's Press, Montreal, pp. 242–280.
- Webb, K. 2012 *Political risk insurance, CSR and the mining sector: an illustration of the regulatory effects of contracts*. *Int. J. Law Manage.* 54 (5), 394–415.
- Webb, K. 2015a ISO 26000 social responsibility standard as 'Proto Law' and a new form of global custom: positioning ISO 26000 in the emerging transnational regulatory governance rule instrument architecture. *Transnatl. Legal Theory J.* 6 (2), 1–35.
- Webb, K. 2015b *MB8612 CSR and Sustainable Mining, Corporate Social Responsibility Class Presentations*. Yates School of Graduate Studies, Ted Rogers School of Management, Masters of Business Administration, Ryerson University, Toronto.
- Webb, K. & Morrison, A. 2004 The law and voluntary codes: examining the 'tangled web'. In: *Voluntary Codes: Private Governance, the Public Interest and Innovation* (K. Webb, ed.). Carleton University Research Unit for Science and Innovation, Ottawa, pp. 97–174.
- Webb, K., Cruz, R. & Walsh, P. 2017 *A comparative review of the role of markets and institutions in sustaining innovation in cleantech: a critical mass approach*. *Int. J. Innov. Sustain. Dev.* 11 (2/3), 149–169.
- Wellington, A., Burley, C. & Rollinson-Lorimer, M. 2010 The Walkerton tragedy: a comprehensive chronology. In: *Environmental Law and Policy in the Canadian Context*. (A. Greenbaum & A. Wellington, eds.). Captus Press, Concord, pp. 511–538.
- Wong, G. 2013 Optimizing the water lifecycle with real time data. *Municipal World* 36, 13–14.
- Wood, S. & Johannson, L. 2008 How not to incorporate voluntary standards into smart regulation: ISO 14001 and Ontario's environmental Penalties Regulations. *Comparative Research in Law & Political Economy* – York University, CLPE Research Paper 4 (2), 1–72.
- York Region 2004 *Proposed Regulatory Changes – Drinking Water Quality Management Standard Under the SDW*. Staff Report No. 1, (online), available from: <http://archives.york.ca/councilcommitteearchives/pdf/rpt%201%20cls%201-71.pdf> (accessed 02 December 2016).

First received 11 December 2016; accepted in revised form 14 June 2017. Available online 19 July 2017