

PROVING CAUSATION: SCIENTIFIC CERTAINTY VS. LEGAL BURDEN OF PROOF

Danielle Meuleman*

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*Crown Counsel, Ontario Ministry of the Attorney General, Legal Services Branch for Environment & Climate Change — *The views presented in this paper and my accompanying presentation are my own and are not intended to represent the Province of Ontario, Ministry of the Attorney General or the Ministry of the Environment & Climate Change.*

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Neither law nor science operates in a world of absolutes. In the legal world we talk about proof in terms of standards — beyond a reasonable doubt, balance of probabilities — and tests for causation — but for, material contribution. In contrast, scientists use terms like: scientific method, uncertainty factors, statistical associations. At their core, both law and science rely on evidence, and, in the end, both law and science ultimately come to conclusions despite some amount of uncertainty. This paper discusses the somewhat unique world of environmental law, where science often takes centre stage.

At the core of most environmental statutory regimes is the prohibition on the discharge of substances that have the potential to harm the environment and/or human health.¹ The definition of “substance” (also referred to as “contaminant”, “pollutant”, “material”) is necessarily very broad and usually includes: solids, liquids, gases, odours, heat, sound, vibration, etc. Therefore, evidence of the breach of these prohibitions rarely turns on the nature of the substance discharged. More often the debate focusses on proof that the substance caused an adverse effect that is prohibited.

DO WE ALWAYS NEED EXPERTS TO PROVE CAUSATION?

Let’s start with a look at Ontario’s *Environmental Protection Act* (EPA) which has one of the most expansive definitions of ‘adverse effect’ in Canadian legislation. Adverse effect is defined as one or more of:

- (a) impairment of the quality of the natural environment for any use that can be made of it,
- (b) injury or damage to property or to plant or animal life,
- (c) harm or material discomfort to any person,
- (d) an adverse effect on the health of any person,
- (e) impairment of the safety of any person,
- (f) rendering any property or plant or animal life unfit for human use,
- (g) loss of enjoyment of normal use of property, and
- (h) interference with the normal conduct of business.²

Keeping in mind this definition, you can see that sometimes proof of causation is very straightforward and requires nothing more than common sense. In a recent case out of the Supreme Court of Canada, *Castonguay Blasting Ltd. v. Ontario (Environment)*,³ the

¹ Ontario’s *Environmental Protection Act*, RSO 1990, c E19, s 14 [EPA] (I will use Ontario as the core example throughout this paper but each province has similar legislation).

² EPA, s 1(1) “adverse effect”.

³ *Castonguay Blasting Ltd v Ontario (Environment)*, 2013 SCC 52 [Castonguay].

defendant was charged with failing to report the discharge of a contaminant into the natural environment that caused, or was likely to cause, an adverse effect.⁴ The facts of the case were simple — the defendant was retained by the Ministry of Transportation to blast out a rock face allowing an adjacent highway to be widened. In the course of blasting a series of rocks flew out of the controlled blast area onto a nearby residential property, causing property damage to the home and to the vehicle parked in the driveway. Luckily no one was injured. No expert witnesses were needed to prove the nature of the contaminant (the rocks were a solid), the adverse effects (damage to property, impairment of the safety of any person) or the cause of the adverse effects (the blast sent the fly rock through the air and the damage was caused by the impact of the rocks hitting the home and vehicle). If it looks like a duck and quacks like a duck, the courts are likely find it's a duck — no expert necessary.

Of course, many environmental cases are not so obvious and causation is more difficult to prove. Take the situation where someone is walking down the street and suddenly smells a chemical-type odour, feels irritation in her eyes and a gagging/coughing fit ensues. She ducks (yes, I said duck) into her nearby car and after ten minutes or so feels fine again. While waiting in her car she reports the incident to the local Ministry of the Environment (“MOE”). An MOE Officer later determines that a bath/shower manufacturer in the area reported a small processing upset that same afternoon which resulted in the discharge of excess styrene (an aromatic organic compound). Styrene is known to cause eye irritation and irritation of the nose/mouth upon inhalation. The company reported that the discharge was minimal and its employees didn't notice any impacts outside of the plant. All of this evidence seems to point to the discharge of styrene as the cause of the impacts on the passerby. But then again maybe not, perhaps this is an area with many industrial operations, any one of which could have discharged something that caused the impacts to this individual; perhaps she was hit with drifting ragweed pollen and had an allergic reaction; or perhaps she was coming down with a cold. Suddenly, the simple case is not so simple. Expert witnesses may be needed to provide evidence of wind direction, air dispersion modelling, a medical doctor to assess causation — to say nothing of the company's potential due diligence defence.

Governments often recognize the difficulties in proving causation with a sufficient degree of scientific certainty in the environmental context and may look to simply proof of causation. For example, the *Ontario Water Resources Act* prohibits the discharge of any material into or near water that may impair the quality of the water,⁵ however, proof of the ‘impairment’ is made more straightforward by a provision in the Act that provides that “the quality of water shall be deemed to be impaired” if any one of a number of criteria are met. These criteria include, that the material may cause a degradation in the appearance, taste or odour of the water; a scientific test that is generally accepted as a test of aquatic toxicity

⁴ Contrary to s 15(1) of the EPA.

⁵ *Ontario Water Resources Act*, RSO 1990, c O40, s 30(1) [OWRA].

indicates that the material is toxic; or a peer-reviewed scientific publication that indicates that the material interference with organisms that are dependent on aquatic ecosystems.⁶ The prosecution will still need to prove that the material can “cause” Proof of these deeming provisions may still require an expert to prove that the material failed the toxicity test or to explain the peer-reviewed study, but there is no doubt that this is more straightforward than prove of *in situ* impairment.

WHAT ABOUT PROOF OF A SUBJECTIVE VALUE?

Looking back at the definition of adverse effects in the EPA you will see that the last two criteria are loss of enjoyment of normal use of property and interference with the normal conduct of business. These can be subjective criteria. Did the fly-rock incident in *Castonguay* prevent the nearby resident from sitting outside enjoying a BBQ while rocks were flying through the air? It’s likely that the fly-rock event only lasted a minute — is this really an invasion on someone’s use of their property that warrants sanction? Maybe this is an easier one to answer, but what about the impact of ongoing odours? While many odours are not actually harmful to someone’s health (e.g. industrial compost operation odours or rendering plant) they can be very off-putting. Would you want to sit outside having a BBQ with friends in mid-July with a constant smell of rotting garbage nearby? Often MOE Officers will “objectively” source and “quantify” the odour (rank it as the worst they have experienced/9 out of 10 in terms of intensity/they wouldn’t sit outside while it was ongoing), as well multiple lay witnesses may provide evidence of their experiences with the odour. Often in these cases expert witnesses are not needed, but there is no doubt that we all bring our own subjective value systems into evaluation of these types of cases.

WHAT ABOUT PROOF OF THE EXACT CAUSE OF A BREAKDOWN THAT RESULTED IN A DISCHARGE?

Industrial operations by their nature ‘discharge’ to the natural environment and, sometimes, things go wrong. Do we need to understand exactly what went wrong to prove that Company A was the source of the discharge of Pollutant X to the nearby river, resulting in fish kill? No, it is not always necessary to know the precise cause of the failure for the Crown to prove the *actus reus*, however, the defendant may want/need to understand the exact cause to prove that it was duly diligent. The leading case in this area is *R. v. Petro-Canada*, a 2003 case out of the Ontario Court of Appeal.⁷ The facts of the *actus reus* in *Petro-Canada* are straightforward (gasoline spill from a pipe at a Petro-Canada facility) but neither the regulator nor the defendant knew the cause of the pipe failure. The court found that it was not necessary for the Crown to prove the precise cause of the failure to make out the offence and it was not incumbent on the defendant to likewise prove the

⁶ OWRA, s 1(3).

⁷ [2003] OJ No 216 [*Petro-Canada*].

precise cause to make out a due diligence defence, however, the court did concede that prove of due diligence would likely be made easier if the exact cause is known:

For these reasons I do not think that the law requires the accused to prove precisely how the discharge came about — in this case precisely why the pipe failed — in order to avail itself of the due diligence defence. On the other hand, in a case where the accused can do this, it may be able to narrow the range of preventative steps that it must show to establish that it took all reasonable care. However where, as here, the accused cannot prove the precise cause of the pipe failure the due diligence defence is not rendered unavailable as a result. That being said, it must be emphasized that to invoke the defence successfully in such circumstances, the accused must show that it took all reasonable care to avoid any foreseeable cause. (emphasis added)⁸

*R. v. Zellstoff Celgar Limited Partnership*⁹ is another case from British Columbia that followed the Petro-Canada decision. In that case a pulp mill was charged with various offences related to discharge of ‘black liquor’ into the Columbia River, including, under subsection 36(3) of *Fisheries Act* — deposit of deleterious substance in water frequented by fish.¹⁰ There were two theories about the nature of the discharge — the Crown’s believed it was ‘black liquor soap’ and the defendant put forward evidence that it was ‘dilute black liquor’ (interestingly it doesn’t appear from the decision that any expert evidence was called by either party on this point — the evidence came from observations of Zellstoff Celgar’s employees). In the end the Court appears to favour the evidence that this was black liquor soap but finds that in any event it doesn’t really matter for proof of the *actus reus* — whichever derivative of black liquor it was found to be deleterious to fish. In looking at due diligence, however, the Court found that while the defendant was likely duly diligent if the discharge was dilute black liquor, it had not made out due diligence if the substance was black liquor soap.

I cannot find on the evidence that the only probable cause of these offences lay with the state of the health of the [effluent treatment system (“ETS”)]. I find there is compelling evidence to suggest the cause of the offences lay with Celgar’s failure to follow its own procedures regarding a soap carryover. As I cannot be satisfied that Celgar has proven the cause of the offense at issue, it follows that Celgar must show it acted with due diligence to prevent any foreseeable cause. As it was obviously foreseeable that the introduction of weak black liquor soap into the ETS would cause a failure of the treatment system, I cannot be satisfied that Celgar has met its onus and shown that it exercised all reasonable care to prevent the commission of these offences.¹¹

CHALLENGING EXISTING LEGISLATION

Up to this point, I’ve mainly focussed on the Regulator’s need to prove harm to make out an offence under environmental legislation. So let’s switch gears a bit and discuss the scenario where someone wants to challenge an environmental law on the basis that it does

⁸ *Petro-Canada*, para 20 (emphasis added).

⁹ 2012 BCPC 38 [*Zellstoff Celgar*].

¹⁰ *Fisheries Act*, RSC 1996, c F-14.

¹¹ *Zellstoff Celgar*, para 56 (emphasis added).

not reflect the current state of science and in doing so may allow harm to the environment or human health. Environmental law doesn't generally seek to eliminate all discharges into the environment, rather it seeks to control them to ensure that where a discharge is permitted it will not result in harm. This can be done by legislation (a regulation that sets a limit on the amount/concentration of substance that can be discharged) or through a more tailored instrument, such as a site specific approval that considers all of the discharges expected from a particular facility.¹² In my opinion, we should start from the proposition that legislation and regulatory guidelines are drafted in accordance with the current state of scientific knowledge. In Ontario all government ministries were required to put in place a Statement of Environmental Values (SEV) to record their commitment to the environment and to be accountable for ensuring consideration of the environment in their decisions. The Ontario Ministry of the Environment and Climate Change's SEV provides that the ministry uses a precautionary, science-based approach in its decision-making to protect human health and the environment.¹³

There have been a series of administrative appeals challenging renewable energy approvals issued to wind turbines farms in Ontario.¹⁴ Most of the appeals are initiated by residents concerned that the noise limits and property setback limits for wind turbines established by regulation are not adequate to protect against harm to human health. More recently, these appellants have also sought to challenge these approvals on the basis that these limits violate their security person rights under section 7 of the *Canadian Charter of Rights and Freedoms*. In a recent decision from the Ontario Divisional Court (sitting on appeal of three such decisions of the Environmental Review Tribunal), *Dixon v. Ontario*, the Court confirmed that the onus is on the appellants to prove the harm alleged, even where the appellants' assert that 'science just doesn't know what is safe':

66 This brings us to the heart of the Appellants' s. 7 claims. They contend that unlike the certainty of scientific knowledge which surrounds the effects of the discharge of a contaminant such as mercury, when dealing with the effect of noise and vibrations from commercial wind farms we are dealing with "known unknowns". The uncertainty of the state of scientific knowledge about the effects on human health of commercial wind farms, according to the Appellants, materially informs the analysis of the Charter adequacy of the review tests found in EPA ss. 142.1(3) and 145.2.1(2). Which leads, then, to the question of whether the statutory test adopted by the Legislature materially departed from the consensus scientific view about the impact of commercial wind turbines on human health. ...

75 On appeals such as these our Court can only consider a question of law; we cannot re-weigh or re-assess the evidence which was before the Tribunals or the factual findings they made. Our purpose in describing the expert evidence which was before the Tribunals on the issue of the impact of wind turbines on human health is a narrow one: to identify that the Tribunals did not have before

¹² For example, see s 9 of the EPA.

¹³ All of Ontario's Statements of Environmental Values (SEV) can be found online: Environmental Registry <<https://www.ebr.gov.on.ca/ERS-WEB-External/content/sev.jsp?pageName=sevList&subPageName=10001>>.

¹⁴ Renewable Energy Approvals (REAs) are issued under s 47 of the EPA and third parties are entitled to appeal REAs pursuant to s 142.1 of the EPA; appeals are heard by the Environmental Review Tribunal.

them expert evidence which seriously called into question the principle underpinning the EPA's renewable energy project regulatory regime -- i.e. that wind turbines which are set back 550m from a dwelling house and which do not generate noise levels in excess of 40 dBA at the lowest specified wind speed do not cause serious harm to human health based upon the current state of scientific knowledge.¹⁵

In attempting to prove harm to human health, individuals living near existing, operating wind turbine projects in Ontario gave evidence at each of the three Tribunal hearings. All of the individuals believed that the turbines operating near their homes caused them to suffer from a range of health impacts (sleep disturbance, headaches, heart palpitations, and more), however, none of these claims were supported by expert medical or epidemiological evidence. In the end, all of the Tribunal decisions found that the evidence of the lay witnesses alone, though sincere, was not sufficient prove that the turbines were the cause of the health impacts.

What if an appellant/applicant challenging environmental legislation does bring forward credible expert evidence? In *Millership v. Kamloops (City)*¹⁶ the appellant alleged that the City's addition of fluoride to the municipal drinking water supply caused him harm (fluorosis of his teeth as a teenager). Mr. Millership presented evidence from a number of experts in support of his position, including a medical doctor concluded that fluoridation is "ineffective" and "dangerous to the health of consumers".¹⁷ Likewise the City of Kamloops put forward expert evidence to the contrary, that fluoridation was safe and beneficial to the public. The British Columbia Supreme Court described the debate in the case as follows:

In this case, there is a great deal of evidence from all parties dealing with the risks and benefits of publically fluoridated water. There is a dispute between the parties whether fluoridation of public water has any benefits or clinically insignificant benefits, and whether it poses risks including skeletal fluorosis, osteoporosis, hip fractures and cancer.¹⁸

The Court in *Millership* sums it all up nicely: "Clearly this is a case where expert evidence is necessary."¹⁹

¹⁵ *Dixon v Ontario (Director, Ministry of the Environment)*, 2014 ONSC 7404, paras 66, 75 (emphasis added) [*Dixon*] — leave to appeal to the Ontario Court of Appeal was filed in January 2015.

¹⁶ 2003 BCSC 82, aff'd 2004 BCCA 9 [*Millership*].

¹⁷ *Ibid*, para 70.

¹⁸ *Ibid*, para 63 (emphasis added).

¹⁹ *Ibid*, para 64.