Canada: Federal Air Pollution Plus Noise Pollution Public Policy

Air pollution plus noise pollution together are a serious public health risk around the world. Governments have done little to protect their citizens. We need a sustainable approach in Canada: federal air pollution plus noise pollution public policy. There are many reasons noise pollution is equally important to prevent along with air pollution.

Air Pollution Plus Noise Pollution

Noise pollution public health limits are based on single source noise exposure, e.g. air traffic or road traffic. This underestimates adverse non-auditory and/or auditory health effects from community exposures from multiple pollution sources. For example:

- Air pollutant + noise pollutant (e.g. aircraft)
- Air pollutant-noise pollutant + air pollutant-noise pollutant e.g. air traffic plus road traffic.

The combined public health risk of more than one pollutant is greater than either pollutant alone.

The European Commission estimates that the social cost of noise and air pollution is up to €1 trillion every year (European Commission, 2016a) and the World Health Organization (2018, p. 8) states,

> *The guidelines do not include recommendations about any kind of multiple exposures. In everyday life people are often exposed to noise from several sources at the same time. In Germany, for example, 44% of the population are annoyed by at least two and up to five sources of noise (Umweltbundesamt, 2015). For some health outcomes, such as obesity, new evidence indicates that combined exposure to noise from several means of transportation is particularly harmful (Pyko et al., 2015; 2017). Research indicates that, alongside exposure to more than one source of noise, combined exposure to different factors – for example, noise and vibration or noise and air pollution – has gained increasing relevance in recent years (Sörensen et al., 2017).*

Federal Noise Policy Responsibilities

Typical federal responsibilities include setting energy and transportation noise emission standards (e.g. wind turbines, air traffic, vehicle traffic, rail traffic). Low noise emission standards can be set for equipment or product manufacturing. These are federal government responsibilities because the noise sources are not in a fixed or single

community location. Multiple communities and community members are exposed to noise sources that fall under federal responsibility.

Examples:
- Air traffic flight paths.
- Road traffic routes.
- Commercial equipment or consumer products.

A possible model that could be adapted for Canada includes the *Quiet Communities Act of 2019* (H.R.3001)[1]. It requires US senate-approved funding of $21,000,000 for each of fiscal years 2019 through 2023. This Act would reestablish the Office of Noise Abatement and Control (ONAC)[2] in the Environmental Protection Agency. Before it was defunded in 1982, ONAC was responsible for:

- Regulations and noise emission standards for major noise sources, e.g. trucks, locomotives and railcars, air compressors, motorcycles, truck-mounted waste compactors, and buses.
- Coordination with federal aviation authority regarding airport noise regulation based on scientific and technical data.
- Labelling for products that emit noise including low noise emission products.
- Oversight of federal noise reduction programs and assist regional and local noise control efforts.

In an article on the *EPA and Noise Abatement*[3]*,* Shapiro (1992, p. 20-21) suggested the main reasons for loss of EPA funding included a belief that "state and local governments could engage in noise control even in the absence of a federal program… [ONAC] lacked strong political allies" and a 1979 regulation limiting garbage truck noise emissions met strong objections from the regulated industry, local noise administrators, and White House staff.

A model used in the European Union includes multiple countries with common transportation noise sources (air traffic, road traffic, rail traffic). This could be adapted for Canada as a large country with common transportation noise sources across multiple provinces and territories.

For countries in the European Union, the *Environmental Noise Directive* (2002)[4] requires strategic noise mapping and action plans for noise management. A European Commission (2016, p. 4)[5] review of the Environmental Noise Directive found "cost-

benefit analysis showed that where action plans—including measures for noise management—have been implemented, the Directive was efficient with a favourable cost-benefit ratio of 1:29."

Public Health-Based Noise Pollution Limits

There are internationally recommended guidelines to prevent adverse communication and/or public health effects from public exposure to noise pollution. In 1999, the World Health Organization recommended noise limits in *Guidelines for Community Noise*[6]. In 2009, limits were updated with more protective *Night Noise Guidelines*[7]. In 2018, additional updates for source noise limits were introduced in *Environmental Noise Guidelines*[8].

The World Health Organization *Environmental Noise Guidelines* (2018, Abstract):

> *provide robust public health advice underpinned by evidence, which is essential to drive policy action that will protect communities from the adverse effects of noise…In terms of their health implications, the recommended exposure levels can be considered applicable in other regions and suitable for a global audience.*

The World Health Organization *Guidelines for Community Noise* (1999, p. xv) states,

> *"An adverse effect of noise refers to any temporary or long-term impairment of physical, psychological or social functioning that is associated with noise exposure." Adverse auditory and non-auditory effects include speech interference, sleep disturbance, annoyance, anxiety, depression, high blood pressure, cardiovascular disease, strokes, cognitive impairment in children, Type 2 diabetes, hearing impairment, tinnitus, dementia, and adverse perinatal and birth effects (WHO, 1999, 2009, 2011[9], 2018, Eriksson, Pershagen, and Nilsson, 2018[10]).*

Noise induced hearing health damage can cause hearing loss for speech-in-noise, tinnitus, and temporary or permanent sensorineural hearing loss (Mayes, 2019)[11].

The World Health Organization *Charter on Transport, Environment and Health* (1999)[12] recommends that community health should be put first when considering transportation noise since adverse environmental effects fall disproportionately on susceptible groups, particularly children, the infirm, and older people. This Charter also recommends the Polluter Pays Principle: those who produce pollution should bear the costs of managing it to prevent damage to human health or the environment. In some European countries, costs are covered locally with additional federal assistance for certain projects like new infrastructure.

For example, in the City of Ottawa, the new light rail transit system project—recently constructed and made operational—is causing noise pollution. If the City of Ottawa project noise mitigation budget runs out, will the Canadian federal government provide extra funding for noise control measures sufficient to protect community disability access, communication access, and public health?

When new light rail or other sustainable transit systems are developed in other locations, will the federal government ensure every Canadian is protected from new greener infrastructure noise pollution?

The Canadian government is responsible for ensuring sustainable public transportation systems are quiet enough to meet public health limits or noise control measures are in place to protect Canadians from air pollution plus noise pollution risk.

Will the government protect Canadians from new green energy harvesting solutions where design of systems ignores noise pollution created during operation (e.g. wind turbines). The World Health Organization *Environmental Noise Guidelines-Executive Summary* (2018, p. 7)[13] has set public health based noise limits for airborne wind turbine noise. The International Congress on Acoustics (2010)[14] identifies the risk of groundborne low frequency noise. Low frequency noise can cause annoyance and disturb sleep[15] which are criteria used to establish World Health Organization public noise limit guidelines.

The Canadian government is responsible for ensuring renewable energy harvest is quiet enough to meet public health limits or noise control measures are in place to protect Canadians from air pollution plus noise pollution risk.

Federal Protection Needed for High Risk Canadians

Groups at higher risk than average from noise pollution include:

- Pregnant women.
- Children (newborns to teens).
- Elders (age 65 and older).
- People with hearing impairment or tinnitus.
- People with chronic cognitive, mental, and/or physical health conditions or illnesses.
- People needing rest and recovery (e.g. illness, after hospital discharge).
- Shift workers.

For groups susceptible to impaired communication access:

> *Noise interference with speech comprehension results in a large number of personal disabilities, handicaps, and behavioural changes. Problems with concentration, fatigue, uncertainty and lack of self-confidence, irritation, misunderstandings, decreased working capacity, problems in human relations, and a number of stress reactions have all been identified (Lazarus, 1998). Particularly vulnerable to these types of effects are the hearing impaired, the elderly, children in the process of language and reading acquisition, and individuals who are not familiar with the spoken language (e.g., Lazarus, 1998). Thus, vulnerable persons constitute a substantial proportion of a country's population (WHO, 1999, p. 24-25).*

Certain groups are also higher risk for sleep disturbance:

> *As children also spend more time in bed they are exposed more to night noise levels. For these reasons children are considered a risk group. Since with age the sleep structure becomes more fragmented, elderly people are more vulnerable to disturbance. This also happens in pregnant women and people with ill health, so they too are a group at risk. Finally, shift workers are at risk because their sleep structure is under stress due to the adaptations of their circadian rhythm (WHO, 2009, p. xii).*

Night noise carries the highest health risk:

> *Sleep disturbance is a major effect of environmental noise. It may cause primary effects during noise, and secondary effects that can be assessed the day after night-time noise exposure. Uninterrupted sleep is a physiological prerequisite for good physiological and mental functioning, and the primary effects of sleep disturbance are: difficulty in falling asleep; awakenings and and alterations of sleep stages or depth; increased blood pressure; heart rate and finger pulse amplitude; vasoconstriction; changes in respiration; cardiac arrhythmia; and increased body movements…The probability of being awakened depends on the number of noise events per night. The secondary, or after-effects, the following morning or day(s) are: reduced perceived sleep quality; increased fatigue; depressed mood or well-being; and decreased performance (WHO, 1999, p. ix-x).*

The World Health Organization (2009, p. 108)[16] states, "Sleep is an essential part of healthy life and is recognized as a fundamental right under the European Convention on Human Rights (European Court of Human Rights, 2003."

Munzel et al. (2018, p. 836)[17] state, "noise-induced sleep disturbance constitutes an important mechanism on the pathway from chronic noise exposure to the development of adverse health effects."

Medical and Economic Costs

Available science shows unhealthy noise pollution already exists in Canadian cities. Gan et al. (2012)[18] used a noise prediction model that reflected actual noise exposure in Vancouver. The annual population exposure to noise pollution was higher than recommended limits for disability access, communication access, and public health.

A 2017 public health noise monitoring study on *How Loud is too Loud? Health Impacts of Environmental Noise in Toronto*[19] revealed that nearly 89% of residents are exposed to unhealthy daytime noise and 43% are exposed to unhealthy night noise. Co-author Dr. Oiamo suggested government decision makers adopt a proactive approach aimed at bettering public health by setting a goal to decrease noise by a certain percentage over a specific number of years.

Noise levels exceeding public health guidelines can contribute to a health burden with significant medical and economic costs. When considering cost-benefit of noise reduction options, Peters and van Blokland (2018, p. 32)[20] state, “some benefits are directly related to a monetary value, such as reduced hospital costs due to lower occurrence of diseases”. Completely preventable adverse noise-health effects with high healthcare costs include anxiety, depression, high blood pressure, heart attacks, stroke, Type 2 diabetes, obesity, and dementia.

Munzel et al. (2018, p. 833) state that in the UK, noise pollution has “been estimated to cause an additional 542 cases of hypertension-related myocardial infarction, 788 cases of stroke, and 1169 cases of dementia, with a cost valued at around £1.09 billion annually.”

Fink (2017, p. 44)[21] describes “increases in stress hormones, hypertension, obesity, cardiac disease, and mortality.” Fink also raises the important issue of disability rights since noise pollution interfering with speech understanding prevents equal communication access in public spaces for high risk populations including children, elders, and hearing impaired.

Federal Air Pollution Plus Noise Pollution Public Policy

The World Health Organization Charter on Transport, Environment and Health (1999)[22] recommends that community health should be put first when considering transportation noise since adverse environmental effects fall disproportionately on susceptible groups, particularly children, people with pre-existing health conditions,

and elders. This Charter also recommends the Polluter Pays Principle: those who produce pollution should bear the costs of managing it to prevent damage to human health or the environment. In some European countries, costs are covered locally with additional federal assistance for certain projects like new infrastructure.

For example, in the City of Ottawa, the new light rail transit system project—recently constructed and now operational—is causing noise pollution. If the City of Ottawa project noise mitigation budget runs out, will the Canadian federal government provide extra funding for infrastructure noise control measures sufficient to protect disability access, communication access, and public health in nearby communities?

When the system expands to other communities, will the federal government ensure every Canadian is protected from new greener infrastructure noise pollution?

Will the government protect Canadians from new green energy harvesting where design of systems ignores noise pollution created during operation (e.g. wind turbines).

The Canadian government is responsible for ensuring renewable energy harvest is quiet enough or noise control measures are in place to protect Canadians from noise pollution risk. Preventing noise pollution is equally important as preventing air pollution.

The federal government has a responsibility to ensure community noise pollution does not violate accessibility rights of Canadians with hearing impairment under the *Canadians with Disabilities Act*.

Summary

Noise pollution risk as been studied and confirmed for decades. The international science evidence is undeniable. Major noise pollution sources have increased and federal decision makers have not prevented public noise exposure (airborne and/or groundborne) from current sources, green transportation infrastructure, or clean energy harvest.

World Health Organization globally recommended noise exposure limits[23]—based on systematic scientific evidence reviews—provide a useful tool for national and local authorities when deciding on noise reduction measures, since the noise-health data helps predict expected adverse effects from observed or expected noise exposure levels.

Public-health based political platforms are required for air pollution plus noise pollution. Human-made noise pollution has an impact on human rights to health, communication, and disability access as well as environmental health. Currently, there is no unified approach to prevent noise pollution in Canada. Federal authorities and decision makers are in a position to set national public health-based noise pollution policy and quiet community legislation.

The most protective national efforts are designed to protect the most high risk or sensitive populations like children, people with pre-existing health conditions, and elders. Effective noise pollution action plans could require mandatory real time noise mapping systems, regular reporting, and mandatory noise control to protect all Canadians.

World Health Organization Environmental Noise Guidelines (2018, p. 105-124) identify guiding principles for policy makers including promoting interventions to reduce exposure to noise to minimize environmental health risk.

> *"The guideline recommendations can also be used by civil society, patients and other advocacy groups to raise awareness and encourage actions to protect the population, including vulnerable groups, from exposure to noise" (WHO, 2018, p. 108).*

Federal government election candidates or political representatives should start setting and meeting federal level responsibilities to protect the Canadian public from air pollution plus noise pollution.

Prepared by:
J.L. Mayes, MSc, Aud(C), RAud
Certified and licensed audiologist.

Cite:

> *Mayes, J.L. (2019, October 6). Canada: Federal air pollution plus noise pollution public policy. Noise Pollution Education Report: 1-10. Available from https://janlmayes.com/education/*

[Canadian spelling and Oxford comma used unless source spelling or use of commas differed.]

Sources

[1] H.R. 3001 - Quiet Communities Act of 2019. 116th Congress (2019-2020). Retrieved from https://www.congress.gov/bill/116th-congress/house-bill/3001

[2] American Public Health Association website, Advocacy for Public Health. Quiet Communities. Retrieved from https://apha.org/policies-and-advocacy/advocacy-for-public-health/action-alerts/quiet-communities

[3] Shapiro, S. A. (1992). Lessons from a public policy failure: EPA and Noise Abatement. Ecology Law Quarterly. Vol. 19:1. 1-60. Retrieved from https://scholarship.law.berkeley.edu/cgi/viewcontent.cgi?article=1408&context=elq

[4] European Union (2002) Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32002L0049&from=EN

[5] European Commission (2016, December 13). Commission Staff Working Document Executive Summary of the Refit Evaluation of the Directive 2002/49/EC relating to the assessment and management of environmental noise. Brussels: 1-4. Retrieved from https://ec.europa.eu/environment/noise/evaluation_en.htm

[6] WHO (1999). Guidelines for Community Noise. Geneva, World Health Organization. Retrieved from https://apps.who.int/iris/handle/10665/66217

[7] WHO (2009). Night Noise Guidelines. WHO Regional Office for Europe. Retrieved from http://www.euro.who.int/en/health-topics/environment-and-health/noise/policy/who-night-noise-guidelines-for-europe

[8] WHO (2018). Environmental Noise Guidelines. WHO Regional Office for Europe. Retrieved from http://www.euro.who.int/en/health-topics/environment-and-health/noise/environmental-noise-guidelines-for-the-european-region

[9] WHO (2011). Burden of disease from environmental noise. Bonn: World Health Organization.

[10] Eriksson, C., Pershagen, G. & Nilsson, M. (2018). Biological mechanisms related to cardiovascular and metabolic effects by environmental noise. World Health Organization. WHO Regional Office for Europe.

[11] Mayes, Jan L. (2019, Feb 18). Urban noise levels are high enough to damage auditory sensorineural health. Sound and the Healthy City, special issue of the Cities and Health Journal, Routlegdge. DOI 10.1080/23748834.2019.1577204

[12] WHO (1999). Charter on Transport, Environment and Health. WHO Regional Office for Europe. Retrieved from http://www.euro.who.int/en/publications/policy-documents/charter-on-transport,-environment-and-health

[13] WHO (2018). Environmental Noise Guidelines-Executive Summary. WHO Regional Office for Europe. Retrieved from http://www.euro.who.int/en/health-topics/environment-and-health/noise/publications/2018/environmental-noise-guidelines-for-the-european-region-executive-summary-2018

[14] International Congress on Acoustics (2010). Low Frequency Noise from Transportation Sources: Proceedings of 20th International Congress on Acoustics: 1-9. Retrieved from https://www.acoustics.asn.au/conference_proceedings/ICA2010/cdrom-ICA2010/papers/p987.pdf

[15] Bolin, K., Bluhm, G., Eriksson, G. & Nilsson, M. (2011, September 22). Infrasound and low frequency noise from wind turbines: exposure and health effects. Environmental Research Letters: 6(3). Retrieved from https://iopscience.iop.org/article/10.1088/1748-9326/6/3/035103

[16] WHO (2009). Night Noise Guidelines. WHO Regional Office for Europe: Table 5.4, Effects of different levels of night noise on the population's health. Retrieved from http://www.euro.who.int/en/health-topics/environment-and-health/noise/policy/who-night-noise-guidelines-for-europe

[17] Munzel, T., Gori, T., Babisch, W. & Basner, M. (2014). Cardiovascular effects of environmental noise exposure. European Heart Journal. 35: 829-836. doi:10.1093/eurheartj/ehu030

[18] Gan, W.Q., McLean, K., Brauer, M., Chiarello, S.A. & Davies, H. W. (2012, July). Modelling population exposure to community noise and air pollution in a large metropolitan area. Environ. Res. 116: 11-6. doi: 10.1016/j.envres. 2012.04.001. Epub 2012 Apr 20.

[19] Toronto Public Health (2017, April).How loud is too loud? Health impacts of environmental noise in Toronto. Technical Report. Retrieved from https://www.toronto.ca/legdocs/mmis/2017/hl/bgrd/backgroundfile-104525.pdf

[20] Peters, I.B. & van Blokland, G. (2018, February). Decision and cost/benefit analysis methods for noise abatement measures in Europe. European Network of the Heads of Environment Protection Agencies, Interest Group on Traffic Noise Abatement: 1-70. Retrieved from https://www.semanticscholar.org/paper/Decision-and-cost%2Fbenefit-methods-for-noise-in-Blokland-Peeters/a80a35ed98a591531ac85711569c1353e1dbbc77

[21] Fink, D.J. (2017, January). What is a safe noise level for the public? American Journal of Public Health, 107(1), 44-45. DOI: 10.2105/AJPH.2016.303527

[22] WHO (1999). Charter on Transport, Environment and Health. WHO Regional Office for Europe. Retrieved from http://www.euro.who.int/en/publications/policy-documents/charter-on-transport,-environment-and-health

[23] WHO (2018). Environmental Noise Guidelines-Executive Summary. WHO Regional Office for Europe. Retrieved from http://www.euro.who.int/en/health-topics/environment-and-health/noise/publications/2018/environmental-noise-guidelines-for-the-european-region-executive-summary-2018

