



HAL
open science

Systematic review of municipal noise regulations in Quebec

Christopher Trudeau, Edda Bild, Thomas Padois, Maxime Perna, Romain Dumoulin, Thomas Dupont, Catherine Guastavino

► **To cite this version:**

Christopher Trudeau, Edda Bild, Thomas Padois, Maxime Perna, Romain Dumoulin, et al.. Systematic review of municipal noise regulations in Quebec. *Forum Acusticum*, Dec 2020, Lyon, France. pp.889-891, 10.48465/fa.2020.0974 . hal-03233770

HAL Id: hal-03233770

<https://hal.science/hal-03233770v1>

Submitted on 13 Jun 2021

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

MUNICIPAL NOISE REGULATIONS IN QUÉBEC

Christopher Trudeau¹ Edda Bild¹ Thomas Padois² Maxime Perna²
Romain Dumoulin³ Thomas Dupont² Catherine Guastavino¹

¹ School of Information Studies, McGill University, Canada

² Department of Mechanical Engineering, École de technologie supérieure, Canada

³ Center for Interdisciplinary Research in Music Media and Technology, McGill University, Canada
Christopher.trudeau@mail.mcgill.ca

1. INTRODUCTION

Noise management is a set of practices that aims to reduce environmental noise levels and the burden that it has on communities. The most common noise management strategy is the development of noise regulations, a shared responsibility between different administrative levels within a country, with each level setting noise limits for its jurisdiction. We reviewed the environmental noise regulations from the province of Québec (Canada) enacted at the municipal level. We focused specifically on the conceptualizations of environmental noise; the use and values of decibel limits; the inclusion of measurement protocols; and the factors used to add specificity to the regulations (e.g. time of day, zoning). In all, 109 documents were analyzed from 74 municipalities across the province of Québec.

2. METHODOLOGY

We first identified five criteria for a sample of Québec municipalities: population; geopolitical region; economic activity; proximity to major transportation infrastructure; and the presence of outdoor recreational events. A total of 87 municipalities were identified following a purposive sampling process that ensured each of these criteria was represented in the dataset.

A search was performed on the official, public websites of the identified municipalities for regulations related to noise, nuisances, peace and order, and environmental protection. The condition for inclusion in this review was that the regulation directly and explicitly covered noise. Thirteen municipalities did not have publicly available regulations governing noise and were excluded from further consideration. This resulted in a total of 74 Quebec municipalities.

2.1 Documents reviewed

Table 1 below lists the number of municipalities included in the final analysis for each population category.

Population	Frequency
Less than 5,000	14
5,000 to 19,999	21
20,000 to 49,999	19
More than 50,000	20
Total	74

Table 1: Number of municipalities included in the final analysis per population category.

Most of the documents reviewed were general, nuisance-related regulations that contained references to noise nuisances. Table 2 below shows the number of each type of document reviewed.

Type of document	Number
Noise regulation	28
Nuisance regulation	67
Pets-regulated regulation	8
Other (e.g. festivals)	6
Total	109

Table 2: Number of documents reviewed per type.

2.2 Analysis of the corpus

The analysis was completed using NVivo software, which is designed to facilitate qualitative research. The documents were coded for noise category; the time of day; the zone; the affected communities and activities; the acoustic measures; the agent creating the sound and certain legal aspects. Through an iterative process, the regulations were coded as being part of one of seven noise categories: general; economic activity; music; fixed equipment; transportation; construction; and recreational activity. The general category was used when no specific details were provided about to characterize the noise (e.g. ambient nighttime noise levels). Where applicable, decibel levels were also coded.

Other elements refer to the context in which it is experienced, in terms of time of day, zoning, activities and communities affected, as well as the agents producing noise.

3. RESULTS

3.1 Conceptualization of noise

A qualitative analysis of definitions across documents indicates that environmental noise can be conceived of as 1) an acoustic phenomenon, 2) an environmental pollutant, 3) a public health concern, or 4) a quality of life indicator. In some regulations, several of these conceptualizations are used. Table 3 below provides selected examples of each of the conceptualizations of noise from different Québec noise regulations.

Concept	Quotation
Acoustic phenomenon	<i>Acoustic phenomenon caused by the superposition of diverse vibrations, whether harmonic or not</i>
Auditory sensation	<i>Auditory sensation caused by the disturbance of an elastic material and</i>

Concept	Quotation
	<i>generated by the stimulation of sensorial parts of the internal ear</i>
Quality of life	<i>Any sound that disrupts well-being, tranquility or the rest and comfort of citizens</i>
Combination	<i>Any sound or group of sounds, harmonious or not, audible to the ear, excessive or unusual, that disturb the peace and tranquility of the neighborhood</i>

Table 3: Examples of noise conceptualization.

3.2 Use of decibel limits

Limits were identified in 35 municipalities (47% of municipalities reviewed). The table below shows the full ranges of the noise limits for each noise category, according to the location of measure and time of day.

Noise category	Location	Fixed limits		Relative limits	
		Day	Night	Day	Night
General	Outdoor	50-85	40-85	2 to 5	
	Indoor	50	45		
	Bedroom	45	35-40		
	Other	45-50	45		
	Impact noise	-	75		
Economic activity	Outdoor	45-60	40-70		
Music	Outdoor	60	55	5	
Fixed equip.	Outdoor	48-65	45-55	5	3
Trans.	Outdoor	50-65 (road) 88-99 (trucks)			
Construct.	Outdoor	50			
Rec. activity	Outdoor	92 (racetrack)			

Table 4: Summary of noise limits per sound category and location of measure. Values in dB(A).

We note a wide variation in the fixed limits between municipalities. However, as **Table 5** below indicates, most limits are found within a 5-10 dB(A) range. There is an especially high range for transportation noise, which represents both regular road traffic and heavy trucks. It is important to note that these limits represent values for different acoustic indicators. This makes it difficult to carry out direct comparisons.

	Outdoor			Indoor		
	0.25	Median	0.75	0.25	Median	0.75
Day	55	60	65	45	45	50
Night	49	50	55	40	40	45

Table 5: First quartile, median and third quartile noise limits per location and time of day. Values in dB(A).

Where regulations do not provide specific noise limits, they instead treat noise as a nuisance and/or place bans on specific, noise-producing activities (e.g. excessive dog barking, unnecessary honking). These strategies are not mutually exclusive within a regulatory document.

3.3 Use of measurement protocols

Measurement protocols include the actions to measure noise levels, as well as the steps and equipment required for each action (e.g. climatic conditions, time and duration of measurements). Protocols were identified in 16 municipalities (21% of the municipalities reviewed). There may be administrative reasons for separating technical procedures from the main regulation, namely this allows for updating procedures without going through lengthy legislative processes.

There were eleven different acoustic indicators used in one or more of the measurement protocols, all belonging to one of four categories: 1) energetic indicators; 2) peak indicators; 3) statistical indicators; and 4) emergence indicators. **Table 6** below indicates the prevalence of each type of indicator.

Type	Example	Frequency
Energetic	$L_{Aeq,T}$	10
Peak	L_{Apeak}, L_{Cpeak}	2
Statistical	$L_{AX\%,T}$	2
Emergence	-	4

Table 6: Prevalence of different types of acoustic indicators in Québec municipal noise regulations.

We note that energetic indicators are the most frequent. Moreover, only two regulations contained the formula for these indicators.

4. DISCUSSION

4.1 Comparison of findings with recommended levels

The reviewed noise limits can be compared with the WHO recommended noise limits, some of which are listed in **Table 7** below.

	Location	Day	Night	
Outdoor		55 dB L_{Aeq}	45 dB L_{Aeq}	[1]
Indoor	Dwelling	45 dB L_{Aeq}	30 dB L_{Aeq}	[1]
	Bedroom	35 dB L_{Aeq}	30 dB L_{Aeq}	[1]
Outdoor	(Road traffic)	53 dB L_{den}	45 dB L_{night}	[2]

Table 7: WHO recommended noise levels per location of measure and time of day.

We note that existing municipal limits in Québec are generally above the limits recommended by the WHO. There are several possible reasons for this, including that the most current regulations may pre-date both the 1999 and the 2018 WHO recommendations.

4.2 Beyond regulations

Due to the focus on the regulatory framework, this review did not include other approaches to noise management. However, regulations are only one noise management strategy that municipalities should consider. Preventive measures are equally important for the reduction of noise problems at the source. Preventive measures include: 1) awareness of noise problems by the public and professionals; 2) noise management plans for construction projects; and 3) urban mobility planning to minimize loud and polluting traffic.

Moreover, it is important to consider how responsibility is shared between all stakeholders. Responsibility for noise is distributed across administrative levels (i.e. local, regional and national), but it should also include private companies (e.g. auto manufacturers) and individuals (e.g. drivers), both of whom contribute to noise production. Providing incentives for companies and individuals to develop and consume quieter equipment is a way to support legislative efforts at noise management.

Finally, regulations, policies and plans need to converge toward a common goal, in which noise is only a component. This includes the need to integrate, for example, urban planning documents, policies concerning pollution and transportation, and acoustic comfort for housing.

5. CONCLUSION

Noise regulations remain a popular tool for noise management. This review of Québec municipal regulations found that nuisance-based regulations are most often used. Furthermore, there is little agreement over the appropriate decibel limit, even within specific noise categories. The protocols used to take acoustic measurements were not always made available to the public within the regulations.

More work needs to be done to understand the challenges faced by municipalities when designing and implementing noise regulations. Any future research should be aimed at helping municipalities meet the challenging noise limits set by the WHO over the last two decades.

6. ACKNOWLEDGEMENT

This research is funded by the Quebec ministries of Health (MSSS) and Environment (MELCC). The authors thank Olivier Doutres of the École de technologies supérieur and Frédérick Hubert of Université Laval for their comments on the report of this research.

7. REFERENCES

- [1] B. Berglund, T. Lindvall, and D. H. Schwela, 'Guidelines for community noise', World Health Organization Regional Office for Europe, 1999.
- [2] WHO, World Health Organization, Regional office for Europe, 'Environmental Noise Guidelines for the European region', WHO, Copenhagen, Denmark, 2018.