Analysis of Proposed Policy to Create an Occupational Exposure Limit for Diesel Engine Exhaust in Ontario

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Background

Diesel engine exhaust (DEE) is one of the most prevalent occupational exposures in Canada. CAREX Canada estimates that approximately 966,000 Canadians are exposed to DEE in their workplace [1]. The Occupational Cancer Research Centre (OCRC) in Ontario has used these estimates to calculate that approximately 560 lung cancers and 200 suspected bladder cancers can be attributed to occupational DEE exposure each year in Canada [2]. A recent CAREX Canada report, which highlights the variability in occupational exposure limits (OELs) that have been adopted in Canada for controlling exposures to DEE, found that few jurisdictions in Canada outside of the mining industry have an OEL for DEE, and none have adopted an OEL that reflects the current state of knowledge and scientific evidence [3]. Further, DEE is an environmental cancer risk in the general population, and the development and enforcement of a DEE OEL would limit exposure and lead to a broader positive health impact in communities. The absence of an evidence based OEL in Canada is also a concern because many occupational disease prevention practices rely on the 'benchmark' of meeting a specific standard.

In 2018, the Ministry of Labour in Ontario, now called the Ministry of Labour, Training and Skills Development (MLTSD), proposed to add a new listing and OEL for diesel particulate matter in the Ontario Table (Table 1) in Regulation 833 of 160 µg/m^3 measured as total carbon (TC) [4]. This general OEL for DEE is the first policy of its kind in Canada [3], but has not yet been adopted.

Purpose

The goal of this study was to build on past CAREX Canada research on setting an OEL for diesel [3] to:

1) Better understand how the Ontario DEE OEL policy was brought forward and developed,
2) Characterize the policy window for setting an OEL in Ontario and
3) Identify whether an opportunity exists for this action to occur in other jurisdictions, specifically Alberta.

This research brief summarizes the analysis of the policy to introduce a general occupational exposure limit for diesel engine exhaust (DEE) proposed by the Ministry of Labour in Ontario [4] and provides recommendations that may help other jurisdictions develop a DEE OEL proposal.

What we did

To understand how the Ontario DEE OEL policy was developed, we conducted an environmental scan of legislation, grey literature, and news articles relevant to the Ontario DEE OEL, conducted 8 key informant interviews, and analyzed the data using the Stages Model and Kingdon's Multiple Streams Framework (MSF).

The Stages Model allows us to present the complex process of public policy development in a fairly simple way [5]. According to this model, the process of producing public policies can be broken into five stages: agenda setting, policy formulation, adoption, implementation, and evaluation [5]. For the purpose of this analysis, we have focused on the first three stages.

John Kingdon's MSF provides a strong tool to understand policy processes, and in particular the agenda setting phase. According to Kingdon, the agenda setting phase consists of three streams: the problem, the policy, and politics streams [6,7]. The three streams flow along different channels and remain independent of one another until, at a specific point in time, a policy window opens. Only then do the streams cross [6].

For this analysis, we have focused on the agenda setting phase, with particular attention on the roles of the policy entrepreneur and the policymaker, and the policy window.

Key Informant interviews

Eight telephone interviews were conducted via Zoom between March 30, 2021, and January 25, 2022, to better understand the agenda-setting, policy formulation, and/or adoption processes related to OELs in Ontario, with a focus on the DEE OEL proposed by the MLTSD in Ontario in 2018 [4].

The interviews ranged from 38 minutes to 72 minutes in length and were conducted by one member of the study team. The audio-recorded interviews were transcribed verbatim using Otter.ai and the quality of the transcriptions were checked by directly comparing the audio recording with the transcription. The transcriptions were analyzed using qualitative content analysis [8] using the software NVivo 12. A conventional content analysis approach was followed since the main aim of the interviews was to describe the informants' views and experiences related to the OEL for DEE proposed by the Ministry of Labour in Ontario in 2018 [9]. After familiarization with the interview content, categories, or common themes were inductively identified for each topic and each interview was analyzed with these themes in mind.

Seven individuals working within Ontario, Canada, were interviewed, as well as one individual in Alberta, Canada. The interviewees' areas of expertise included:

- Occupational hygiene: 2
- Research: 2
- Health and safety/Prevention: 2
- Regulatory activities: 2

All key informants were familiar with the general OEL for DEE proposed by the MLSTD in Ontario in 2018 [4]. Seven of them were involved in one or more stages in the development of the proposed policy.

Agenda Setting

The agenda setting stage refers to the "process through which a policy and the problem it is intended to address are acknowledged to be of public interest" [5]. In Kingdon's MSF, this coincides with the problem stream, in which perceptions of problems are seen as "public" in the sense that government action is needed to resolve them [10].

Seven of the interviewees were part of this stage and agreed that the agenda for the DEE OEL proposal was set over a number of years. The dangers and problematic aspects of DEE exposure were recognized as early as the late 1990s and early 2000s, and this awareness expanded over time due to the development of various groups, reports, presentations, and research evidence with a focus on DEE.

Five key components were identified as part of the agenda setting stage that helped to identify DEE as a problem:

1. Ontario Disease Action Plan (ODAP)
2. ODAP DEE Working group
3. Occupational Cancer Research Centre's (OCRC) Burden of Occupational Cancer in Ontario report
4. Ontario Mining Review
5. International Agency for Research in Cancer's (IARC's) classification of DEE

Additional agenda setting events included activities via: the Mine Diesel Emissions Council (MDEC) [15], Mining Safety and Health Administration (MSHA) [16], Occupational Health Clinics for Ontario Workers (OHCOW) [17], American Conference of Governmental Industrial Hygienists (ACGIH) [18], Health Effects Institute [19].

Ontario Disease Action Plan (ODAP):

ODAP is a working group formed in 2016. It was a Ministry of Labor (MLTSD) initiative and was led by the Occupational Health Clinics for Ontario Workers (OHCOW). The objective of this group was to align the Occupational Health and Safety (OHS) System's efforts on occupational disease prevention, specifically the prevention of hazardous exposures and reduction of occupational disease burden in Ontario workplaces. It included representatives from all OHS System partners (MLTSD, Workplace Safety and Insurance Board/WSIB, six Health and Safety associations, four specialty research centers), as well as Public Health Ontario and The Lung Association [11].

ODAP DEE Working group:

This sub-group was created in 2017 after a prioritization process in which DEE was recognized as one of the top priorities. A list of the top 10 exposures/diseases was prioritized based on the prevalence or need for prevention, potential for impact, and opportunity to leverage other prevention activities in the province. A sub-committee was developed for each of the top three diseases/exposures, of which DEE was one. This purpose of the group was not to address the OEL specifically, but rather to increase or raise awareness of DEE as a hazard [11].

Occupational Cancer Research Centre's (OCRC) Burden of Occupational Cancer in Ontario report:

The OCRC published "The Burden of Occupational Cancer in Ontario" report in 2017. It highlighted that DEE is one of the priority carcinogens, and between 2-10% of all newly diagnosed cancer cases are due to past occupational exposures. The report provided evidence on the most important occupational risk factors for cancer in Ontario, citing CAREX Canada's 2006 exposure estimates, and included recommendations for prevention. Approximately 301,000 workers in Ontario, or nearly five percent of the province's working population, were occupationally exposed to DEE. Two key recommendations for preventing DEE exposure were made in the report: 1) Adopt occupational exposure limits of 20 $\mu g/m^3$ elemental carbon [EC] for the mining industry and 5 $\mu g/m^3$ EC for other workplaces, and 2) Upgrade or replace old on-road and off-road trucks and diesel engines [12].

Ontario Mining Review:

In December 2013, the Minister of Labour asked the Chief Prevention Officer to undertake a Mining Health, Safety and Prevention Review focusing specifically on the occupational health and safety needs of the underground mining sector while maintaining a productive and innovative mining industry. The review, which was published in 2015, focused on five priority hazards, one of which was occupational disease hazards.

Deaths related to occupational illness have not declined over the past several decades. The report identified opportunities to raise awareness among workers and employers of the importance of controlling hazards, and particularly airborne hazards in underground mines, to increase understanding of the health effects of exposure to DEE in underground mines, and to improve controls. It also suggested to review and update OELs for airborne hazards in underground mines, and to identify and publicize available options for monitoring ventilation in underground mines in order to reduce concentrations of airborne hazards [13].

International Agency for Research on Cancer (IARC) classification of DEE:

In 2012, IARC classified DEE as a Group 1, *carcinogenic to humans*, based on sufficient evidence for lung cancer and limited evidence for bladder cancer in humans [14].

Policy Formulation

According to the Stages Model, "The policy formulation stage is where governments, perhaps with the assistance of outside experts, seek to identify the range of possible responses/various policy options to a given definition of the problem [20]."

In Kingdon's MSF, this coincides with the politics stream in which policymakers have the motive and opportunity to turn a solution into policy [21]. The policy entrepreneur and the policy maker play a critical role in this steam, and the importance of these roles were confirmed in our analyses. The policy entrepreneur is an advocate of policy change [22] and takes advantage of "windows of opportunity" to promote policy change [6]. The "policy makers have the motive and opportunity to turn a solution into policy". Policy makers must pay attention to the problem and

be receptive to the proposed solution. They consider many factors, including their beliefs, the "national mood," and the feedback they receive from interest groups and political parties" [21].

A precursor to this stage is the window of opportunity or policy window. A "policy window" is a moment in time "when it is possible for policy entrepreneurs to couple a policy to a problem and get attention from policy makers. These policy windows can be regular events, like budget decisions or elections, but they can also be more random ones" [6,7].

Only one key informant was directly involved in this stage and took on the pivotal role of both the policy entrepreneur and policy maker. Kingdon recognized that the policy entrepreneur "could be in or out of government, in elected or appointed positions, in interest groups or research organizations" [6]. The policy entrepreneur in this case was within government and took part in various events that would fall under the interest group/research organization umbrella. Therefore, they were well-informed about the conversations surrounding DEE and its status. Furthermore, this informant recognized the policy window and decided that the time was right to suggest a DEE OEL proposal.

Consistent with other Canadian jurisdictions, Ontario's OELs are primarily based on limits recommended by the American Conference of Governmental Industrial Hygienists (ACGIH). However, the ACGIH does not have a Threshold Limit Value (TLV) for DEE, necessitating that the MLTSD propose one on their own. The main factor that influenced the chosen OEL was the Mining Safety and Health Administration (MSHA) limit of 160 µg/m^3 TC that was adopted in 2008 [23]. This limit was chosen because it was evidence-based, already adopted by MSHA, and a sellable and reasonable limit, and was thus considered an appropriate first step.

Policy adoption

The policy adoption stage is "the stage during which decisions are made at the governmental level, resulting in a decision that favours one or more approaches to addressing a given problem [5]."

As of yet this policy has not been adopted but it is still considered to be alive. In 2018, it went through a consultation process. This process includes posting a consultation document on the MLTSD website and notifying key stakeholders directly by e-mail to solicit feedback. Once the consultation closes, MLTSD staff review stakeholder submissions and hold focused meetings with stakeholders, where necessary, to gain a better understanding of comments raised. On occasion, MLTSD may defer the adoption of OELs for certain substances if the issues raised require more time to address through further research.

We obtained the DEE OEL consultation comments via a Freedom of Information (FOI) request. The comments were predominantly supportive of the OEL and did offer some advice on potential ways to improve the chosen OEL. This may be one of the reasons that further discussion of the OEL was deferred to the Mining Legislative Review Committee (MLRC). The MLRC is a committee established under Section 21 of the Occupational Health and Safety Act (OHSA) with a mandate to advise the Minister about occupational health and safety issues related to the mining sector [24].

The stakeholder meetings also identified ventilation issues in underground mines as a barrier to the adoption of this policy. This is another reason why the MLRC has revisited the DEE OEL and proposed various amendments to the Regulation 854. A consultation process for proposed changes to the Regulation 854 (Mines and Mining Plants) was posted on July 28, 2021 [25]. The consultation document includes a request for comments for an amended DEE OEL of 120 µg/m^3 in EC and for other amended ventilation requirements.

Literature review

The literature review resulted in few relevant sources and will thus not be discussed here.

What we found

The study analysis showed that the 2018 policy proposal loosely followed the stages model and/or Kingdon's MSF, though this was not a planned process. The ultimate DEE OEL policy proposal more or less just happened, which can often be the case for policies.

There was a clear agenda setting stage/problem stream that included various groups, reports, presentations, and research evidence focussed on DEE that were developed over a period of two decades. Ultimately, this led to a window of opportunity in 2018. However, the exact parameters that opened this policy window are not clear, but may have been the combination of the ODAP meetings, which were attended by the policy entrepreneur/policy maker, the updated research evidence about DEE, and the upcoming provincial election that prompted the policy entrepreneur/policy maker to launch the policy formulation stage/politics stream and propose the DEE OEL.

The roles of the policy entrepreneur/policy maker were vital to this entire process. Without them, this policy proposal would not have been possible. In this policy example, these two roles were vital in spurring action, and would likely be necessary in other jurisdictions looking at introducing a DEE OEL.

Since policy adoption is still ongoing, whether and when this policy will be successfully adopted is not known. However, the involvement of the MLRC is a promising step forward, and hopefully the conversation will loop back to the general DEE OEL proposal in Regulation 833.

Can a similar approach be applied to Alberta?

One of the goals of this project was to determine whether the development path of the DEE OEL in Ontario could be applied to other jurisdictions, and in particular Alberta. One key informant from Alberta was interviewed to better gauge the possibility of developing a DEE OEL in Alberta. The interviewee felt that there is always a possibility for developing an OEL for DEE in Alberta; however, currently this is not a highly prioritized workplace hazard.

Alberta, like most other Canadian jurisdictions, sets OELs based on the ACGIH TLVs. Typically, the ACGIH TLVs are reviewed every few years, with the last review, which re-examined the

2012 TLVs, occurring in 2014 [26]. However, the OELs differ from the ACGIH TLVs for a few substances [27], and there are four substances for which Alberta has an OEL but there is no coinciding ACGIH TLV [26]. This means that a substance like DEE that does not currently have an ACGIH TLV could be considered on its own for an OEL, if warranted.

Alberta aims to conduct an OEL review every 5 years; however, it has now been 8 years since the last review. The next OEL review is slated for 2023-2024 [28], but whether DEE will be part of this review is unclear. For the OEL review, a Technical Working Group (TWG) will be created based on representation from key industry stakeholders, labour, and government. The TWG will decide which OELs need to be further examined and potentially updated. The TWG will likely focus on substances that already have an agenda set or that stakeholders have been vocally concerned about. Whether there is an established agenda for DEE is unknown.

Based on the policy process in Ontario, the agenda setting stage was vital to the development of the DEE OEL. A first step for Alberta would be to encourage stakeholders to voice their concern about DEE in order to set the agenda setting stage/problem stream into motion.

Recommendations

The following recommendations may apply to other jurisdictions that are seeking to develop a DEE OEL and may help to initiate the policy process.

- Set the agenda setting stage in motion. This could be accomplished via workers' health and safety groups, unions, interest groups, or research organizations.
- Keep information about DEE current. Share new information, research, and resources among various stakeholders.
- Ensure that DEE is seen as a problem that needs government action to help resolve.
- Write to the Ministries about the importance of including an OEL for DEE (e.g., the Occupational Health Clinic for Ontario Workers' (OHCOW) annual submission to the MLTSD [17]).
- Identify potential policy entrepreneurs/policy makers and ensure they are within government.
- Promote active involvement of policy entrepreneurs/policy makers within interest groups or research organizations outside of government.

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