Monetizing health co-benefits of electric vehicles using air quality modelling

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Research Goal

- Air pollution is responsible for one in seven premature deaths in Canada. Private and heavy-duty vehicle air pollution, including criteria air contaminants (CACs) has tremendous immediate health impacts.
- Transportation electrification provides an excellent opportunity with staggering value from a health perspective beyond lifetime ownership cost savings and climate benefits.
- We have estimated the health co-benefits of the proposed amendments to federal zero-emission vehicle (ZEV) sales targets, which offer more stringent targets.



MODELLING APPROACH

ECCC's steps to estimate the Benefit Per Tonnes (BPTs):

- 1. SMOKE model used to develop emissions reduction scenarios using 2015 emissions as the base case
- 2. GEM-MACH model was used to assess the effect of changes in emissions.
- 3. Health Canada's Air Quality Benefits Assessment Tool (AQBAT) estimates the health impacts in monetary terms resulting from the air quality changes.
- 4. Divide the total monetized health impacts by the total emissions change to yield BPT values



MODELLING APPROACH

Followed the steps below to estimate the health benefits of ZEV mandate

- 1. Projected the baseline ZEV passenger car and light truck sales between 2026-2050
- 2. Projected the incremental ZEV passenger car and light truck sales between 2026-2050
- 3. Quantified the carbon impact of ZEV passenger car and light truck implementation
- 4. Quantified the change in air pollutant emissions resulting in ZEV passenger car and light truck sales.
- 5. Calculated the health BPTs of air pollutant emission reductions
- 6. Estimated the monetized health impacts of ZEV implementation



RESULTS

Potential Reductions (2026-2050)	Ontario	PM2.5	NOx	VOC	NH3
Cumulative Carbon Reductions (tCO ₂ eq)	139,187,100	12,000	778,000	826,000	60,000
Discounted monetized health impacts (\$)	20,628,719,200	396,553,500	747,189,900	206,192, 900	495,691,900

