Neutral Factual Analysis of Initiative Measure No. 1631

Potential Air Quality Impact in the Puget Sound Region

Initiative Measure No. 1631: Potential Air Quality Impact in the Puget Sound Region

Initiative measure number 1631 (I-1631) is a proposal to enact a carbon emission fee in Washington State, starting at $15 per ton carbon dioxide equivalents (CO2e) in 2020 and ramping up $2 per year to reach $45 per ton CO2e in 2035. By reducing activities that produce carbon emissions, the initiative is expected to also reduce air pollution and improve public health. In addition, the initiative has a provision to fund programs that could yield air quality benefits. In this summary, we conservatively estimated how much air pollution I-1631 is likely to reduce.

The initiative would reduce fine particles and nitrogen dioxide, among other pollutants, mostly near busy roadways. Fine particles are 2.5 micrometers in diameter or smaller. Fine particles cause health problems such as breathing troubles, heart and lung disease, stroke, and premature death. Nitrogen dioxide is a reactive gas that can irritate the lungs and lower resistance to respiratory infections. Children, older adults, and people with preexisting health conditions are more at risk. Studies show that reducing fine particle pollution improves public health. For this reason, the Agency prioritizes reducing fine particle pollution in our region.

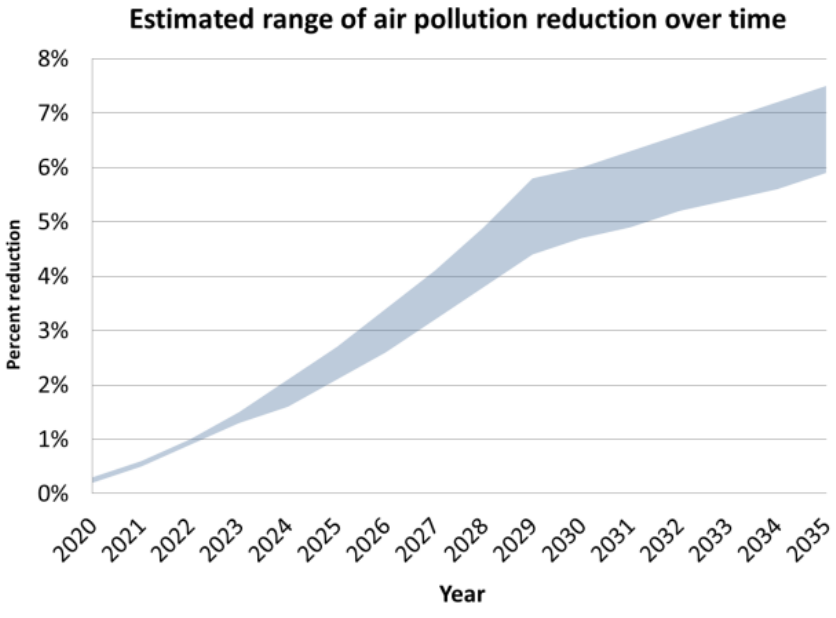
I-1631's Estimated Impact

From 2020 to 2035, we estimate roughly a 3% reduction in air pollution from cars and trucks resulting from the direct fee (averaged over the entire time period, and ending with an annual reduction of 6-7% in 2035). This is equivalent to removing about 200,000 cars or 30,000 trucks from the Puget Sound region's roads.

The direct fee would result in an estimated 1 to 4 fewer deaths per year in 2025, as well as an estimated 200 fewer lost work days and 1,000 less days lost from limited activity due to illness annually in the Puget Sound region (for details on all these estimates, see the appendix at the end of this summary).

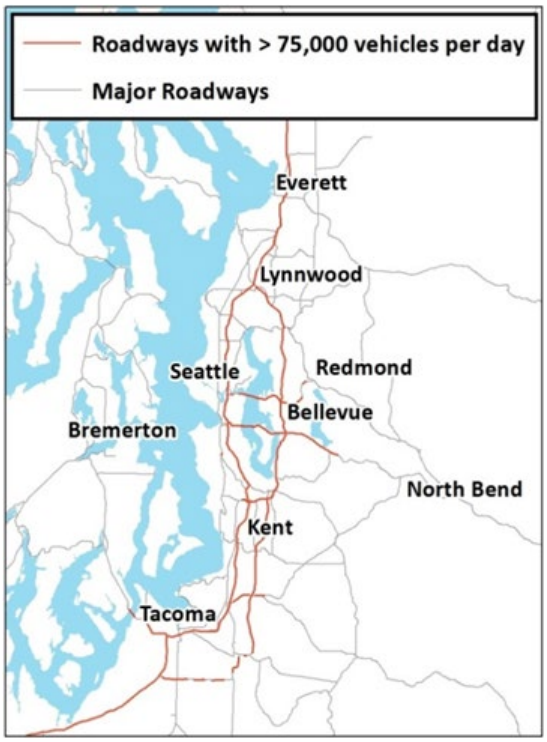
Figure 1 below shows the estimated reduction in air pollution per year as a result of the annual fee.

Figure 1. Estimated percent air pollution reduction from on-road vehicles from I-1631 over time resulting directly from a carbon fee.



We expect these reductions would be greatest within a few hundred yards of the busiest roadways. To illustrate where these pollution reductions are expected to occur, we provide a map in Figure 2 that shows highways in our area with at least 75,000 vehicles passing through each day. Studies show that neighborhoods living closest to busy roadways have higher pollution levels.

Figure 2. Roadways with over 75,000 vehicles per day and other major roadways in the Puget Sound region



I-1631's Additional Programs

I-1631 would also fund programs and projects that could yield air quality benefits. Past Agency projects focusing on reducing diesel pollution have shown that for every $10,000 invested, 30 pounds of fine particles are reduced annually.

The initiative aims to invest 35% of the direct fee's revenue into "clean air projects." If this revenue were invested in projects similar to the Agency's previous actions, the resulting additional pollution reduction in our region would be about 500 tons of fine particle pollution. This would equal about half of all the annual vehicle emissions in the Puget Sound region. This estimate assumes funds are distributed by the population of our region.

Public health benefits from the I-1631 funds are difficult to estimate at this time since there are a multitude of possible projects that could qualify for funding, and we did not predict a cumulative air quality benefit from these various projects.

Appendix to Potential Air Quality Impact from Initiative Measure Number 1631 in the Puget Sound region

Initiative measure number 1631 (I-1631) is a proposal to enact a carbon emission fee on various large GHG emitters.[1] This summary by the Puget Sound Clean Air Agency (Agency) estimates potential air quality changes in our region if I-1631 were approved by the voters.

According to I-1631, the fee would be based on the carbon content of the fossils sold or used (burned) in the state. This analysis estimates some of the air pollution reductions that would result from the reduced burning of these fossil fuels. This analysis also only looks at air quality impacts within the Agency's jurisdiction (King, Kitsap, Pierce, and Snohomish Counties).

The recent *Puget Sound Clean Air Agency Greenhouse Gas Emission Inventory* estimates the greenhouse gas emissions for King, Kitsap, Pierce, and Snohomish Counties for the year 2015.[2] This inventory showed that on-road vehicles are 35% of the carbon emissions resulting from activities in the region. The air pollution that comes from transportation sources such as cars, trucks, and buses are collectively referred to as "traffic-related air pollutants".

One important type of traffic-related air pollutant is fine particle pollution. Fine particles are 2.5 micrometers in diameter or smaller. Fine particles cause health problems such as breathing troubles, heart and lung disease, stroke, and premature death. Children, older adults, and people with preexisting health conditions are more at risk.[3,4,5] Studies show that reducing fine particle pollution improves public health.[6,7] For this reason, the Agency prioritizes reducing fine particle pollution in our region.

Also, a significant amount of nitrogen dioxide in our region comes from vehicles. Nitrogen dioxide is a reactive gas that can irritate the lungs and lowers resistance to respiratory infections.[8]

The other carbon emission sources (not on-road vehicle related) would either yield relatively small air quality improvements to our region (like built environment improvements) or would be exempt from I-1631 (like airplanes), and are not included in this analysis.

Table 1 below shows the estimated reduction in fine particle and nitrogen dioxide levels per year, following the price per ton of carbon schedule in I-1631. By the year 2035, the estimated cumulative reduction in fine particles is in the range of 350 to 450 tons and nitrogen dioxide is 14,000 to 17,000 tons. The cumulative fine particle emissions reductions are equivalent to removing 170,000-220,000 cars or 30,000-40,000 trucks from the road.[9] The estimated health impacts of the avoided emissions in the year 2025 are in Table 2.[10]

For context, the EPA National Emission Inventory reports on-road vehicle emissions as 1,700 tons of fine particle emissions and 56,000 tons of nitrogen dioxide for the year 2014 within the Agency's four-county region. We expect most of these reductions would happen near the busiest car and truck roadways.[11]

Table 1. Estimated Puget Sound region annual fine particle and nitrogen dioxide reductions according to the proposed I-1631 fee schedule. [12,13,14]

Carbon fee per ton	Year	Baseline on-road fine particle emissions (tons)	Baseline on-road nitrogen dioxide emissions (tons)	Fine particle reduction (tons)	Nitrogen dioxide reduction (tons)	Percent reduction
$15	2020	1,180	42,000	3-4	110-120	0.2-0.3%
$17	2021	1,110	40,000	6-7	220-260	0.5-0.6%
$19	2022	1,040	38,000	10-11	340-400	0.9-1.0%
$21	2023	980	36,000	13-15	470-560	1.3-1.5%
$23	2024	920	34,000	15-20	560-720	1.6-2.1%
$25	2025	870	33,000	18-24	690-890	2.1-2.7%
$27	2026	820	31,000	22-28	820-1,050	2.6-3.4%
$29	2027	770	30,000	25-32	960-1,210	3.2-4.1%
$31	2028	720	28,000	28-36	1,090-1,390	3.8-4.9%
$33	2029	680	27,000	31-40	1,200-1,560	4.4-5.8%
$35	2030	640	26,000	30-39	1,210-1,550	4.7-6.0%
$37	2031	600	24,000	30-38	1,200-1,540	4.9-6.3%
$39	2032	570	23,000	30-38	1,200-1,530	5.2-6.6%
$41	2033	530	22,000	29-37	1,200-1,530	5.4-6.9%
$43	2034	500	21,000	29-37	1,190-1,520	5.6-7.2%
$45	2035	470	20,000	28-36	1,180-1,510	5.9-7.5%
--	*Total*	*12,400*	*475,000*	*350-450*	*14,000-17,000*	*2.8-3.5%*

Table 2. Estimated Puget Sound region health benefits from the estimated reductions in fine particles and nitrogen dioxide in the year 2025. [10]

Health measure	Low estimate	High estimate
Total health benefit in dollars	$12,000,000	$35,000,000
Mortality	1	4
Nonfatal heart attacks	0	2
Acute Bronchitis	2	3
Upper Respiratory Symptoms	40	55
Lower Respiratory Symptoms	30	40
Asthma Emergency Room Visits	0.6	0.8
Minor Restricted Activity Days	1,000	1,500
Work Loss Days	200	250
Asthma Exacerbation	45	55
Asthma Exacerbation, Cough	10	15
Asthma Exacerbation, Shortness of Breath	10	20
Asthma Exacerbation, Wheeze	20	30

I-1631 would also fund programs and projects that could yield air quality benefits. Additionally, there's another proposed fund related to projects directly in pollution and health action areas that could also yield air quality benefits. These air quality improvements are difficult to estimate at this time since there are a multitude of possible projects that could qualify, and we did not predict a cumulative air quality benefit scenario from these various projects.

To help give a general idea of what the investment to air quality benefit may look like, we provide here a median emission per dollar estimate of 30 pounds of fine particles reduced annually for every $10,000 invested. This estimate is based on the median value from some of the Agency's past diesel emission reduction projects. This includes projects such as repowering locomotives and tugboats and replacing older school buses, trucks, and cargo handling equipment in our region. By 2023, the Fiscal Impact Summary for I-1631 estimates about $2B net cumulative revenue (after expenditures) over these first five years.[15] If the entire 35% of the fund went to similar clean air projects (an upper estimate of the air quality benefit), the resulting additional fine particle pollution reduction would be about 500 tons of fine particle pollution reduced in our region by 2023.

We expect these reductions would be greatest within a few hundred yards of the busiest roadways. To illustrate where these emission reductions are expected to occur, we compiled Table 3 below, which estimates populations living near the busiest roadways in 2010.[16] Studies show that neighborhoods living closest to busy highways have higher pollution levels.[11,17,18]

Table 3. Maximum 2010 population living within different distances to roadway for a specified traffic volume within our 4-county jurisdiction (King, Kitsap, Pierce, and Snohomish).[19]

Traffic Volume	< 100 meters	< 200 meters	< 300 meters	< 400 meters	< 500 meters
40,000+	260,000	380,000	490,000	610,000	720,000
75,000+	165,000	240,000	320,000	400,000	480,000
100,000+	140,000	200,000	270,000	340,000	405,000
200,000+	15,000	25,000	40,000	50,000	70,000

Notes and references

[1] Original text: https://www.sos.wa.gov/_assets/elections/initiatives/finaltext_1482.pdf

[2] Puget Sound Clean Air Agency Greenhouse Gas Emissions Inventory, June 2018, prepared by Cascadia Consulting Group, https://www.pscleanair.org/DocumentCenter/View/3328/PSCAA-GHG-Emissions-Inventory?bidId=

[3] Brugge et al, "Near-highway pollutants in motor vehicle exhaust: A review of epidemiological evidence of cardiac and pulmonary health risks", Env Health, 2007, 6, 23.

[4] HEI Panel on the Health Effects of Traffic-Related Air Pollution, "Traffic-related air pollution: a critical review of the literature on emissions, exposure, and health effects", HEI Special Report 17, Boston, MA: Health Effects Institute; 2010.

[5] Brook et al, "Air Pollution and Cardiovascular Disease: A Statement for Healthcare Professionals from the Expert Panel on Population and Prevention Science of the American Heart Association", Circulation, 2004, 109, 2655-2671.

[6] Laden et al, "Reduction fine particulate air pollution and mortality: Extended follow-up of the Harvard Six Cities study. Am J Respir Crit Care Med, 2006 Mar 15; 173(6):667-72.

[7] US EPA, "Integrated Science Assessment for Particulate Matter (Final Report)", EPA/600/R-08/139F, Dec 2009.

[8] US EPA, "Integrated Science Assessment for Oxides of Nitrogen – Health Criteria (First External Review Draft)", EPA/600/R-13/202, Nov 2013.

[9] Estimate derived using the WA State Department of Licensing Vehicle counts for 2014 and using the emissions from the 2014 US EPA National Emission Inventory for King, Kitsap, Pierce, and Snohomish Counties for light and heavy-duty vehicles to derive 2014 emission factors. Since engines and fuels have become cleaner over time, we used the emissions trend for each pollutant since 2002 through 2016 according to EPA's Washington State emission trend data for highway vehicles to forward project and downscale the emissions through 2035 using an exponential fit: https://www.epa.gov/air-emissions-inventories/air-pollutant-emissions-trends-data

[10] Using COBRA version 3.2.1, using the 2025 analysis year, and using 7% discount rate for King, Kitsap, Pierce, and Snohomish counties for the estimated emission reductions in 2025 as in Table 1.

[11] Karner et al, "Near-roadway air quality: synthesizing the findings from real-world data." Environ Sci Technol. 2010 Jul 15; 44(14):5334-44.

[12] The carbon price per ton annual increase was not increased with any inflation in this estimate, which I-1631 would allow for.

[13] We used the Washington State Department of Commerce Carbon Tax Assessment Model (CTAM) to estimate resulting percent reductions per year from the increase in gas and diesel (motor vehicle) fuel greenhouse gas emissions listed in the transportation sector category compared to the base case for scenarios A through C (which includes a low growth and high growth case). We used version 3.5 updated July 12th 2018: http://www.commerce.wa.gov/wp-content/uploads/2018/08/Energy-CTAM-3-5-EIA-Ref-2018-July-12.xlsx.

[14] We used the latest on-road mobile emission data available (from the 2014 US EPA National Emission Inventory for King, Kitsap, Pierce, and Snohomish Counties) to quantify the fine particle and nitrogen dioxide emissions in the region, applying the percentage reduction in greenhouse gas emissions for each year. Since engines and fuels have become cleaner over time, we used the emissions trend for each pollutant since 2002 through 2016 according to EPA's Washington State emission trend data for highway vehicles to forward project and downscale the criteria pollutant emissions through 2035 using an exponential fit: https://www.epa.gov/air-emissions-inventories/air-pollutant-emissions-trends-data. We assume the state trend data are representative for the Puget Sound area for this analysis.

[15] I-1631 Fiscal Impact Statement: https://www.ofm.wa.gov/sites/default/files/public/budget/ballot/2018/I-1631_Fiscal_Impact_Statement-082418.pdf.

[16] Washington State Department of Transportation traffic segment data for 2017. http://www.wsdot.wa.gov/mapsdata/geodatacatalog/Maps/noscale/DOT_TDO/TrafficGeoportal/TrafficGeoportalSourceDataIDX.htm

[17] US EPA 2014 National Air Toxics Assessment, https://www.epa.gov/national-air-toxics-assessment/2014-nata-assessment-results.

[18] Puget Sound Clean Air Agency, Near-road Air Toxics Study in the Chinatown-International District, Aug 2018, https://www.pscleanair.org/DocumentCenter/View/3398/Air-Toxics-Study-in-the-Chinatown-International-District-Full-Report

[19] From a 2014 Puget Sound Clean Air Agency analysis. Estimated using the sum of the population information from 2010 census blocks within said distance to roadway. The roadways were screened for traffic volume based on 2012 Washington State Department of Transportation traffic count shapefile (http://www.wsdot.wa.gov/mapsdata/geodatacatalog/Maps/noscale/DOT_TDO/TrafficPlanningTrends/TPTTrafficIDX.htm). As some blocks can be fairly large, these may be overestimates particularly in more remote areas where the census block geographies may be too high.