**From:** Heil, Cynthia L (DEC)
**To:** Smith, Rebecca T (DEC)
**Subject:** Attachment to comment - Leach
**Date:** Monday, July 29, 2019 8:35:39 AM
**Attachments:** AKDEC-FNSB-Serious-SIP_Leach-Public-Comment_2019.07.26.pdf

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| *21) Comment:* | **Please see the attached PDF document for comments on the methodology of the economic analysis and suggestions of how to improve the economic analysis to ensure the analysis recommends solutions that maximize public net benefit and are economically efficient.** | | | |
| *21) Fiscal Impacts:* | **False** | | | |
| *21) Submission Detail:* | 07/26/2019 12:37 PM | http://dec.alaska.gov/Applications/Air/airtoolsweb/Home/ViewAttachment/16856548/oFW7T4t937l8nIOKxcz1yA2 | Tim Leach | timkayaks@hotmail.com |

To: Alaska Department of Environmental Conservation
From: Tim Leach
RE: Proposed changes in regulation – FNSB Serious SIP
Date: July 26, 2019

## Introduction

I am supportive of regulatory efforts to curtail $PM_{2.5}$ emissions due to the persistence and severity of the air quality problem in the greater Fairbanks region. However, I believe a more thorough economic analysis of the problem and the possible control measures, using a cost-benefit analysis (CBA) framework, would lead to regulation that is economically efficient and that optimizes societal outcomes. My comments below highlight trade-offs and externalities related to the FNSB $PM_{2.5}$ air quality issue and recommend the use of a cost-benefit analysis framework to ensure the federal air standards are attained and maintained with the most economically efficient and socially optimal means. If the Alaska Department of Environmental Conservation (AKDEC) seeks to reduce the cost of a CBA, while still identifying the likely range of costs and benefits, to better inform its policy making a benefit transfer approach is recommended. Included in the discussion are studies that can be used for this benefit transfer approach.

## Trade-Offs & Externalities

The FNSB air quality issue illustrates well the issue of trade-offs or sacrifices that are made to get a product or service. Wood and coal are common fuels for space heating in the region due to their availability and low cost, high fuel oil cost, and the lack of widespread availability of cleaner burning natural gas. However, the pollution from the combustion of wood and coal has been a problem for years and at times the air quality is so bad that residents have difficulty seeing across the street.[1] The benefit of inexpensive heating fuel comes at the cost of air pollution which increases medical expenses, results in lost wages and productivity, reduces property values, and can also increase costs to local governments in the form of federal sanctions if severe air pollution continues.[2][3]

If decisionmakers desire economically efficient allocations of resources and socially optimal policies the externalities in the above paragraph must be considered in order to determine how individual preferences impact individual and societal costs. "Externalities are [the cost] effects of production or consumption that have an impact on third parties who have no voice on either the supply or the demand side of the market."[4] Externalities are a result of inadequate price signals and missing markets which cause a

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[1] Murphy, K. (2013), *Fairbanks area, trying to stay warm, chokes on wood stove pollution,* Los Angeles Times, retrieved May 9, 2019 at http://articles.latimes.com/2013/feb/16/nation/la-na-fairbanks-air-pollution-20130217 .

[2] Fairbanks North Star Borough Air Pollution Control Commission (FNSB-APCC)(2016), *Air Quality Comprehensive Plan - Framework for Healthy Air, People, and Economy,* Fairbanks North Star Borough, at 25, retrieved May 9, 2019 at http://fnsb.us/transportation/AQDocs/FNSBAPCC%20AQComprehensivePlan2016.pdf.

[3] Chay, K., and Greenstone, M. (2005), *Does Air Quality Matter? Evidence from the Housing Market,* Journal of Political Economy, University of Chicago Press, vol. 113(2), pages 376-424, April, retrieved May 27, 2019 at https://www.nber.org/papers/w6826.

[4] Dolan, E. (2012), *Fracking and the environment: An Economic Perspective,* Roubini EconoMonitor, at 1, retrieved May 8, 2019 at https://moneymaven.io/economonitor/emerging-markets/fracking-and-the-environment-an-economic-perspective-rzYjYrUaNEKWz_xJHzBnew/.

misalignment of cost causer and cost payer and can lead to market failure.[5] Public policy which does not account for negative externalities promotes inefficient allocation of resources through overproduction and overconsumption of the damaging good or service.[6] Conversely, policies that do not account for positive externalities promote underproduction and underconsumption of the beneficial good or service, which also leads to inefficient allocation of resources.[7]

In the Fairbanks region residents who opt to burn wood and coal benefit from lower private marginal costs and force the social marginal cost onto their neighbors. This negative externality is, effectively, a wealth transfer from those damaged by the pollution to those producing the pollution. When residents opt for cleaner fuels, they create a positive externality; increasing their private marginal costs, through increased capital expense for new equipment and increased operating expense for ongoing purchases of heating fuel, while providing benefit to their neighbors by decreasing the social marginal cost of air pollution. This positive externality is also a wealth transfer, albeit a more benevolent one. Economic efficiency requires maximization of the net-present value.[8] To achieve this, the cost and benefit categories must be identified, valuated, and internalized. Anything short of this is highly likely to be economically inefficient and produce sub-optimal outcomes that reduce public welfare.

## Public Goods

Air quality is a public good with nonexclusive and largely nonrival characteristics and no well-defined property rights.[9] These attributes affect the provisioning of this public good. Households and firms do not place enough value on air quality as it is subject to the classic free rider phenomenon. Further, an agent who negatively impacts the air quality does not bear all the consequences of his or her decision because the benefits and costs of their action are shared across society.[10] This misallocation is the externality, discussed above, which helps explain individual preference, as the agent will act in their own self-interest, but also reveals the competitive market will not produce an efficient outcome nor maximize welfare. This market failure justifies policy intervention.

## Policy Proposal Cost-Benefit Analysis Framework

Economists Tietenberg and Lewis state, "When emissions standards are the policy of choice, there is no reason to believe that the authority will assign the responsibility for emissions reduction in a cost-minimizing way."[11] This supposition is illustrated by the Fairbanks region $PM_{2.5}$ air quality case, where authorities have not identified the full range of damage categories, valuated damages, or, with a few exceptions, estimated the cost of control measures. The economic analysis performed for the Fairbanks $PM_{2.5}$ Serious SIP was limited to assessment of direct costs and benefits of residential fuel switching and

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[5] Graves, P. (2007), *Environmental Economics, A Critique of Benefit-Cost Analysis,* Rowman & Littlefield Publishers Inc., Lanham, Maryland and Plymouth, U.K., at 57.

[6] *Id.*

[7] *Id.,* at 59.

[8] Tietenberg, T., and Lewis, L. (2018), *Environmental and Natural Resource Economics, 11th Edition,* Routledge, Taylor & Francis Group, New York and London, at 335.

[9] Helbling, T. (2018), *Externalities: Prices Do Not Capture All Costs,* International Monetary Fund, retrieved May 11, 2019 at https://www.imf.org/external/pubs/ft/fandd/basics/external.htm.

[10] *Supra,* Tietenberg and Lewis, note 8, at 25.

[11] *Id.*, at 342.

best available control technology retrofit of utility scale generation due to budget and data constraints.[12][13][14]

While law prohibits the use of cost-benefit analysis (CBA) in *setting* NAAQS, conducting an economic analysis when developing a SIP allows state and local jurisdictions to identify least-cost measures that provide an efficient pathway to NAAQS attainment and optimal allocation of resources. In fact, the National Environmental Policy Act (1970)(NEPA) requires a CBA where major federal regulatory action is expected.[15] Following is a discussion of the proposed policy, cost and benefit categories, and valuation methods that can be used to identify optimal solutions to the Fairbanks region $PM_{2.5}$ air quality issue.

## Policy Recommendations, Costs & Benefits

In May 2019 AKDEC proposed draft regulations and a draft Serious State Implementation Plan (SIP) which excluded several of the control measures discussed or recommended by the Stakeholder group. Six of these measures should be reconsidered as they have the potential to reduce costs of attaining and maintaining $PM_{2.5}$ NAAQS and increase the net benefit of the policy outcomes. The six measures include: an annual fee for point sources that do not opt for best available control technology (S3), use of revenue generated to offset "impacts of wood smoke" (S4), a surcharge on #2 fuel oil (S14), publicly funded voluntary residential energy efficiency retrofit program prioritizing wood-burning homes in nonattainment area (S15), requiring home energy audit at the time of sale (S16), and the communication of damage costs of $PM_{2.5}$ non-attainment (S41).[16]

Two of the measures are market mechanisms that are likely to result in market responses that are more cost-effective and flexible than what would be realized under a strict command-and-control approach; an annual fee for point sources that do not opt for best available control technology (S3) and a surcharge on #2 fuel oil (S14).[17] The function of these charges is two-fold, to internalize social marginal costs in the fuel price and combustion activity at the point source and to generate revenue for the Stakeholder recommendations to offset "impacts of wood smoke" (S4), and communicate damage costs of $PM_{2.5}$ non-attainment to the public (S41). These measures can be modeled after the 1973 Japanese Law for the Compensation of Pollution-Related Health Injury.[18] The level of the fees can be determined by the needs of the pollution compensation fund or by the monetized value of avoided social marginal costs that will be realized when attaining the $PM_{2.5}$ NAAQS . The structure of the two fees should be carefully considered

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[12] State of Alaska Department of Environmental Conservation (AKDEC)(2019a), *Residential Fuel Expenditure Assessment of a Transition to Ultra-Low Sulfur and High Sulfur No. 1 Heating Oil for the Fairbanks PM-2.5 Serious Nonattainment Area,* retrieved May 23, 2019 at https://dec.alaska.gov/media/16394/uls-hs-fairbanks-cost-analysis-finaldraft-05082019.pdf.

[13] State of Alaska Department of Environmental Conservation (AKDEC)(2019b), *Fairbanks PM2.5 Serious SIP,* see Economic Analysis section, retrieved May 29, 2019 at https://dec.alaska.gov/air/anpms/communities/fbks-pm2-5-serious-sip/.

[14] Little, J., interview conducted June 3, 2019. Dr. Joe Little is the M.S. Economics Program Director for the University of Alaska Fairbanks who assisted AKDEC with the residential fuel-switching economic assessment.

[15] 42 USCS § 4331; 42 USCS § 4332.

[16] State of Alaska Department of Environmental Conservation (AKDEC)(2019c), *State Air Quality Control Plan - Vol. II: III.D.7.7 - Control Strategies, Public Notice Draft*, at III.D.7.7-7 & III.D.7.7-8, retrieved May 29, 2019 from https://dec.alaska.gov/media/16210/iiid707-control-strategies-public-notice-draft.pdf.

[17] *Supra,* Tietenberg and Lewis, note 8, at 369.

[18] *Id.,* at 365.

so as to avoid a doubling of the social marginal cost value when assessing a fee on fuel oil that will be burned in a point source that will also be assessed a fee.

The two remaining measures, a publicly funded voluntary residential energy efficiency retrofit program prioritizing wood-burning homes in nonattainment area (S15) and a requirement for a home energy audit at the time of sale (S16), focus on energy efficiency. These measures are recommended because energy efficiency generally has been shown to be the least-cost means of meeting energy end-use needs.[19] In addition to reduced cost, energy efficiency retrofits of residential structures, as shown through the Home Energy Rebate Program administered by the Alaska Housing Finance Corporation, typically results in 33 percent reduced energy use.[20] Both of the proposed measures have costs associated with them which could be funded with revenue generated by the point source fee and fuel surcharge mentioned above. Alternatively, these programs, as opposed to being grant-funded can switch to a more sustainable financed model, whereby public entities and utilities provide low- or no-interest loans for energy audits and energy retrofits and consumers pay the loans back with the direct cost-savings realized through reduced energy usage. This approach would preserve the other revenues for pollution victim compensation.

Overall, pursuit of these policies as part of the response to the Fairbanks region air quality issue are likely to increase efficiency in the allocation of resources for the attainment and maintenance of the $PM_{2.5}$ NAAQS by identifying, valuating, and internalizing externalities that would otherwise work against the intended outcomes of the CAA. Additionally, ambitious pursuit of energy efficiency will help offset implementation costs. In addition to improving air quality, these policies will also:

1. Reduce damages to human health through decreased mortality and morbidity,
2. Reduce damages to production through increased economic output due to reduced work-day losses and reduced tourism, and
3. Reduce damages to property values

## Recommendations for Valuation Methods

A cost-benefit analysis should be conducted to determine which mix of policy tools is optimal, from those adopted by AKDEC and proposed here. Identification of the damage categories and valuation of the damages will also be an important step in determining the efficient level of fees to assess on polluting goods and services.

As budgets are limited a full CBA may be cost-prohibitive. To reduce the cost of a location specific valuation, Dr. Joe Little recommends a benefit transfer approach, but cautions that because Alaska is so unique, studies should not be adopted without scrutiny for comparable conditions.[21] While still qualified by this 'Alaska factor', he recommended the U.S. Environmental Protection Agency (EPA) Environmental

[19] American Council for and Energy-Efficient Economy (ACEEE)(2014), *How Much Does Energy Efficiency Cost?,* at 1, retrieved Nov. 16, 2018 from http://aceee.org/sites/default/files/cost-of-ee.pdf.
[20] Goldsmith, S., Pathan, S., and Wiltse, N. (2012), *Snapshot: The Home Energy Rebate Program,* University of Alaska Anchorage, Institute of Social and Economic Research, retrieved June 17, 2019 from https://iseralaska.org/static/legacy_publication_links/2012_05_16-HERP.pdf.
[21] *Supra*, Little, note 14.

Benefits Mapping and Analysis Program (BenMAP) which combines population data with air quality impact and valuation studies to conduct a benefits assessment using benefit transfer methodology.[22] The general value produce by BenMAP can be checked by summing the individual damage category valuations described below.

To monetize the health damages from $PM_{2.5}$ emissions a 2010 study by the Alaska Department of Epidemiology, the *Association between Air Quality and Hospitalization Visits – Fairbanks 2003 – 2008* can be used as a starting point.[23] The report categorizes health damages but does not monetize the value of the damages.[24] A benefit transfer method, using the report *Economic analysis of health effects from forest fires*, can be used to for the valuation.[25]

To valuate damages to production, Dr. Little recommended using Graff, Zivin and Neidell's 2011 paper, *The Impact of Pollution on Worker Productivity.*[26] Additionally, particulate matter pollution can harm tourism. To estimate damage values for this sub-category of production, a benefit transfer method can be used with the report, *Estimating the Impact of Air Pollution on Inbound Tourism in China: An Analysis Based on Regression Discontinuity Design.*[27]

To evaluate damages to property value, an aversion expenditure model to identify and value what households are doing to avoid poor air quality in the Fairbanks region. For example, those with the means may move to higher elevations to avoid the poor air trapped below by temperature inversions. Households could also be surveyed to determine investment in products like air filters. These revealed preferences would establish a minimum willingness-to-pay but would not capture the full value of air quality. As the Fairbanks region has a small housing market, an aversion model may not yield significant results. Likewise, identifying changes in property value through a local/regional hedonic assessment would not be practicable. As a result, the benefit transfer methodology, using the report *Does Air Quality Matter? Evidence from the Housing Market,* is recommended.[28]

## Conclusion

The greater Fairbanks region is grappling with a serious air quality problem with no easy solution. Residents and small businesses in the area face trade-offs when choosing one heating fuel type over another. Many residents opt for wood and coal because of availability, cost, and an interest in self-sufficiency. Those individuals do not bear the full cost of their choice, as the social cost of air pollution is borne by all who live in the area through increased medical expenses, decreased productivity, and

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[22] U.S. EPA (n.d.), *Environmental Benefits Mapping and Analysis Program – Community Edition (BenMAP-CE)*, retrieved May 3, 2019 at https://www.epa.gov/benmap.

[23] State of Alaska Department of Epidemiology (2010), *Association between Air Quality and Hospital Visits - Fairbanks 2003-2008,* Anchorage.

[24] *Supra,* AKDEC (2019a), note 12, at 29.

[25] Rittmaster, R., Adamowicz, W.L., Amiro, B., and Pelletier, R.T. (2006), *Economic analysis of health effects from forest fires,* Can. J. For. Res. 36: 868-877, doi:10.1139/X05-293.

[26] Graff Zivin, J.S., and Neidell, M.J. (2011), *The Impact of Pollution on Worker Productivity,* Working Paper 17004, National Bureau of Economic Research, Cambridge, MA, retrieved June 3, 2019 at https://www.nber.org/papers/w17004.

[27] Dong, D., Xu, X., and Fung Wong, Y. (2019), *Estimating the Impact of Air Pollution on Inbound Tourism in China: An Analysis Based on Regression Discontinuity Design,* Sustainability, 11, 1682, doi:10.3390/su11061682.

[28] *Supra,* Chay and Greenstone, note 3.

reduced property values. These negative externalities produce inefficient allocations of resources, specifically promoting overconsumption of fuels that impact air quality. As clean air is a public good, public policy intervention is warranted.

AKDEC, overseen by the USEPA, has adopted traditional command-and-control policies to remedy the $PM_{2.5}$ pollution problem in the Fairbanks region. Even though command-and-control policies are effective, they do not typically result in efficient allocation or resources or produce optimal outcomes. Policymakers should continue crafting regulation that realigns the cost-causers with the cost-payers to internalize externalities and balance marginal costs with marginal benefits. Specifically, the market-based and energy efficiency related policies recommended by the Fairbanks Air Quality Stakeholders Group should be carefully considered by AKDEC for adoption.

To determine the policy mix that will result in efficient allocation of resources and produce the maximum net benefit for society AKDEC with the assistance of USEPA should develop a cost-benefit analysis. When developing the regulatory response to this pollution problem the agencies should not let perfect be the enemy of the good. If a range of costs incurred by the production and consumption of a good is unknown, agency personnel and policymakers should not wait to account for the costs that are known. "The fact that we can't measure something precisely is not evidence that its value is zero."[29]

[29] *Supra,* Dolan, note 4, at 3.