

Legislative Health Note: Environmental Justice Amendment Act of 2023 (B25-0564)



Bill summary:ⁱ

“Bill 25-564 would establish a “cumulative impact statement” process that must be completed to obtain District permits and other relief for environmentally harmful actions in overburdened communities. It would also establish a modified statement to assess District agency plans that impact the siting of significant sources of environmental harm in overburdened communities. Among other things, it would also establish an environmental justice division at DOEE [Department of Energy and Environment].”¹

What is the goal of this health note?

Decisions made in sectors outside of public health and health care, such as in education, housing, and employment, can affect health and well-being. Legislative health notes are intended to provide objective, nonpartisan information to help legislators understand the connections between these various sectors and health. This document summarizes evidence analyzed by the Health in All Policies Initiative at the Johns Hopkins University Bloomberg School of Public Health while creating a health note for the Council of the District of Columbia Bill 25-0564. Legislative health notes are not intended to make definitive or causal predictions about how a proposed bill will affect the health and well-being of constituents. Rather, legislators can use a health note as one additional source of information to consider during policymaking. The analysis does not include the bills’ fiscal impacts.

How and why was this bill selected?

The Health in All Policies Initiative received a request from the Council of the District of Columbia legislative staff to analyze the potential health effects of the Environmental Justice Amendment Act of 2023. The health note screening criteria confirmed the bill’s appropriateness for analysis (See Methodology on page 6). Research has consistently demonstrated a link between industrial activity, environmental quality, equity, and health outcomes.²

Summary of health note findings

This health note sought to identify potential health effects of implementing cumulative impact statements (CISs) to identify and mitigate the inequitable burden of industrial development that often disproportionately affects low-income or racially minoritized communities in urban settings. There is a new and growing body of evidence demonstrating the compounding harms of social and environmental

ⁱ Summary as described by the Council of the District of Columbia, <https://lms.dccouncil.gov/Legislation/B25-0564>.

stressors—such as poverty and air pollution, respectively—for human health and health equity.³ Whereas governmental regulation and action have often focused on sources of pollution, CISs or assessments are designed to account for the interplay of multiple environmental hazards, coupled with other social or neighborhood conditions such as housing quality, income, or access to healthy foods, and their effects on health. The potential for CISs to affect environmental justice and well-being is an emerging research area. Though there is limited existing evidence, no studies have analyzed links between CISs and health outcomes. Below is a summary of findings regarding the effects of urban industrial uses on health outcomes and health equity.

- **Strong evidence** shows that industrial activity and urbanization increase air pollution and air toxics, which in turn are linked to increased prevalence of lung cancer, cardiovascular and respiratory illnesses, allergic disease, and subsequent premature deaths.⁴ Emerging research has identified a potential link between exposure to airborne fine particulate matter (PM 2.5) and oral health problems.⁵
- There is **strong evidence** that specific population groups, such as low-income and racially minoritized individuals, are disproportionately affected by urban industrial activity and subsequent emissions.⁶
- There is **strong evidence** that the built environment, including dense concentrations of pavement and lack of vegetation like those seen in industry-heavy neighborhoods in Washington, D.C., creates an urban heat island effect, increasing residents' exposure to extreme heat during warm months.⁷
- **A fair amount of evidence** indicates that poor environmental quality can negatively affect mental health through multiple biological and psychosocial pathways. However, the strength of evidence varies across different environmental factors and outcomes.⁸ Poor environmental quality is linked to “urban stress” and can be associated with psychological harm among some social groups.⁹

Effects of urbanization and industrial activity on environmental quality and human health

Living near industrial facilities and hazardous waste disposal sites affects physical and mental health through multiple pathways.

- The impacts of urban industrial activity on air quality and subsequent health effects are well documented. Industrial facilities emit “carbon dioxide (CO₂), sulfur and nitrogen oxides (SO_x), particulate matter (PM), heavy metals, and volatile organic compounds (VOCs).”¹⁰
 - Heavy metals and VOCs are considered hazardous air pollutants or “air toxics,” and many chemicals in this category are known to cause cancer. Cancer risks from air toxics in D.C. are particularly high, with formaldehyde being the most common, followed by Carbon Tetrachloride, polycyclic aromatic hydrocarbons, and polycyclic organic matter. The U.S. Capitol Power Plant in Ward 6 emits the most formaldehyde in the city, followed by the Ivy City rail yard in Ward 5, which is scheduled for an upgrade.¹¹ The CIS process proposed in this bill poses an opportunity to reduce current or prevent future increases in formaldehyde emissions from this site.

- Exposure to fine particulate matter is one of the greatest environmental health risks globally and is linked to cardiovascular disease, respiratory illness, and allergies.¹² The World Health Organization estimated that air pollution causes 6.7 million premature deaths each year across the globe.¹³
- A review article found that increased exposure to fine particulate matter (PM2.5) is likely linked to worse oral health. Although more research is needed, this review supports the broader evidence base linking prenatal and postnatal exposure to air pollution and poor respiratory, cardiac, and oral health conditions.¹⁴
- One review article highlighted the significant relationship between exposure to environmental air pollution and the development of childhood asthma. The review found that childhood asthma is distributed inequitably across urban areas, with children living near industrial facilities exhibiting higher rates of chronic respiratory illness.¹⁵
- One literature review found that urbanization increases air pollution, which is associated with the worsening of allergic diseases across the population. Industrialization, global economic, and urban growth are linked to an increased prevalence of population allergies.¹⁶
- Exposure to extreme heat has negative effects on human health. Heat waves are linked to increases in mortality, with more intense heat waves and heat waves occurring earlier in the summer having the greatest impacts. One study found a 2.49% increase in mortality risk with every 1°F increase in heat wave intensity.¹⁷
 - Urbanization and industrial facilities have contributed to a phenomenon known as urban heat islands (UHI), caused in part by replacing naturally occurring vegetation with pavement or building materials that trap heat from the sun during the day and continue to release that heat back into the atmosphere throughout the night.¹⁸ Heat islands can, in turn, increase building energy use and greenhouse gas emissions while harming air quality during warm periods.¹⁹
 - An analysis by Climate Central noted that Washington, D.C. experiences “sprawling heat intensity.” In other words, the UHI effect is measurable across the entire city rather than localized in the urban core.²⁰
 - Urban greenery, green roofs, and “cool pavements” such as permeable or reflective pavement are evidence-based strategies to help mitigate the UHI effect.²¹

The relationship between urban industrial activity and health equity

- Environmental and health data show that individuals who are part of racially minoritized groups are more likely to live near sources of urban pollution, including near roadways. One study that examined the geographic distribution of air pollution-related disease in Atlanta found that African Americans were disproportionately susceptible compared to other racial or ethnic groups.²²
- A systematic review and meta-analysis on health outcomes in redlined neighborhoods found living in a historically redlined neighborhood significantly increased the risk of adverse health outcomes for residents. The disproportionate impact of environmental and occupational exposures for people residing in redlined areas necessitates neighborhood-level interventions that address the effects of historic industrialization and divestment.²³

- Industrial uses in urban areas can also indirectly contribute to environmental hazards. For example, facilities that pollute the air, water, and soil can result in a stock of substandard housing—posing further health risks via mold and deteriorating lead paint and water service lines—and a lack of health-promoting community resources such as full-service grocery stores.²⁴

Effects of environmental quality and pollution on mental health

Environmental quality can affect mental well-being and brain health.

- A scoping review found that poor environmental quality and degradation in an urban setting can increase “urban stress” and is linked to psychological harm, although evidence around causation is not definitive.²⁵
- Several studies have documented the effects of air pollution on mental and brain health.
 - A narrative review found evidence suggesting associations between various environmental pollutants and mental health disorders, including anxiety, mood, and psychotic syndromes, with varying levels of certainty across different pollutants and outcomes.²⁶
 - One study that examined New York City emergency room data found that short-term exposure to fine particulate matter and ozone was associated with increased visits for psychotic disorders and that individuals ages 19-34 years old and non-White patients were most susceptible to the effects of PM2.5.²⁷ Another study that did not focus specifically on urban settings found that increases in fine particulate matter and nitrogen dioxide exposure correlated with hospital admissions for depression and schizophrenia.²⁸ Researchers who examined first hospital admissions data for neurological disorders among adults 65 and older found an association between long-term exposure to fine particulate matter and an increase in the risk of Parkinson’s disease, Alzheimer’s disease, and related dementias.²⁹
- A narrative review that explored the psychological effects of chronic environmental contamination found that people who experience adverse health effects from environmental exposures are most likely to suffer psychological distress if they feel the institutions responsible dismiss or ignore their concerns. This has important public health implications, as addressing how institutions respond to environmental harm could reduce the psychological impacts on affected individuals.³⁰
- One study found that living close to industrial facilities was correlated with depression, feelings of powerlessness, and perceptions of neighborhood disorder.³¹

Who is most likely to be affected by this bill?

- Lower-income communities and communities of color frequently bear a disproportionate burden of environmental pollution due to several factors, including the siting of industrial uses.³² In Washington, D.C., most industrial facilities are located within Wards 4, 5, 7, and 8, which have the city’s highest concentrations of Black residents, while the city’s only operational hazardous waste disposal facility is in Ward 5.³³ Furthermore, individuals with disposable income who live in urban areas with poor environmental quality may have the resources to spend time outside their neighborhood or city and reap the physical and mental benefits of spending time in nature.

- Older adults exposed to fine particulate matter in the air over long periods are susceptible to neurological disorders and dementia.³⁴
- Industrial development and building materials that store and release heat into the environment contribute to D.C. residents' exposure to extreme heat by obstructing natural nighttime cooling. A Climate Central analysis noted that this effect, referred to as the urban heat island, is measurable across the entire city rather than being localized in an urban industrial core.³⁵ Therefore, any efforts to mitigate the UHI effect of future industrial facilities in the wards mentioned above could help to reduce extreme heat exposure for all District residents, commuters, and visitors.
- To the extent that this proposed legislation reduces the environmental harm of future industrial facilities in Wards 4, 5, 7, and 8, the future employees in covered facilities stand to benefit. Participants in one observational study noted that exposure to neighborhood environmental pollution happens both at home, due to proximity to industrial facilities, and through occupational exposure, as many residents work in nearby industries.³⁶

Why do these findings matter for the District of Columbia?

The U.S. Environmental Protection Agency's Risk Screening Environmental Indicators Model ranked Washington, D.C. in the top quartile of most polluted metropolitan areas in the United States.³⁷ District residents are exposed to soil, water, and air pollutants. The environmental risks of urban industrial activity disproportionately affect low-income and minoritized populations nationally and locally. The distribution of these effects is evident in the District. An analysis by the D.C. Policy Center found that Wards 4, 5, and 6 residents are most likely to come into contact with pollutants or chemicals from sources other than those linked to personal transportation, household sources, and commercial activity.³⁸

As noted previously, air pollution caused by industrial activity is linked to respiratory illness, allergy, cardiovascular disease rates, and cancers. As of 2021, Washington, D.C., had higher rates of adult asthma (11.6%) than the national average (8%).³⁹ Furthermore, 2018 data showed that 6.5% of White children in D.C. have asthma, compared to 23% of Black children.⁴⁰ Ward 7 has the highest measured levels of fine particulate matter.⁴¹ Increased air pollution combined with the UHI effect in neighborhoods lacking green spaces and shade trees can exacerbate respiratory illnesses.⁴² A NASA map shows that neighborhoods in Northeast, Southeast, and Southwest D.C., which are predominately Black, are the most likely to have higher rates of fine particulate matter-related deaths.⁴³ Other factors like access to health care, smoking rates, chronic stress, and access to quality food can compound or mitigate the effects of PM2.5 exposure.⁴⁴

The Census Tracts with the city's lowest life expectancy averages are found in Wards 4, 5, 7, and 8, with some as low as 63.2 years, compared to the citywide median life expectancy of 76.8 years.⁴⁵

Implementation considerations

The CISs required by this bill could yield important data to avoid the disproportionate impact of environmental harm in low-income neighborhoods and communities of color, especially via new investments. Although new waves of investment, development, and greening have potential health benefits for these same neighborhoods, they can also attract higher-income residents and lead to the displacement of current or long-time residents to other neighborhoods or cities with similar risks of

environmental exposure through substandard housing or air, water, and soil pollution.⁴⁶ Therefore, programs or policies that can potentially increase property values should be coupled with programs to prevent displacement.

The creation of the new environmental justice division at the DOEE could be an essential home for the people who will review CISs. Engaging with the community and disseminating findings to residents should be a priority.

Appendix: Methodology

Once the bill was selected for analysis, a research team from the Health in All Policies Initiative hypothesized connections, or pathways, between the bill, health determinants, and health outcomes. The research team developed these hypothesized pathways using their expertise and a preliminary literature review. The team mapped the selected bill components to steps on these pathways, then developed research questions and a list of keywords to search for. The research team reached a consensus on the final conceptual model, research questions, contextual background questions, keywords, and keyword combinations. The conceptual model, research questions, search terms, list of literature sources, and draft health note were peer-reviewed by two external subject matter experts. The experts also reviewed a draft of the health note. A copy of the conceptual model is available upon request. The Health in All Policies Initiative developed and prioritized six research questions related to the bill components examined:

- To what extent do stricter permitting requirements reduce industrial development?
- To what extent do industrial developments affect local economic development?
- To what extent does heavy industry affect air pollution? Water pollution? Soil pollution?
- To what extent does heavy industry affect the property values of private residences?
- To what extent do industrial developments affect heat islands?
- To what extent do permitting requirements reduce air pollution? Water pollution?

The research team next conducted an expedited literature review using a systematic approach to minimize bias and answer each of the identified research questions.ⁱⁱ The team limited the search to systematic reviews and meta-analyses of studies first since they provide analyses of multiple studies or address multiple research questions. If the team did not find appropriate systematic reviews or meta-analyses for a specific question, they searched for nonsystematic research reviews, original articles, and research reports from U.S. agencies and nonpartisan organizations. The team limited the search to electronically available sources published between 2019 and 2024. The research team searched PubMed and EBSCO databases along with the following leading journals in public health, as well as sector-specific journals suggested by subject matter experts for this analysis to explore each research question: American Journal of Public Health; Social Science & Medicine; Health Affairs; Journal of Urban Health, Journal of Environmental Health, International Journal of Environmental Research and Public Health, and

ⁱⁱ Expedited reviews streamline traditional literature review methods to synthesize evidence within a shortened timeframe. Prior research has demonstrated that conclusions of a rapid review versus a full systematic review did not vary greatly. M.M. Haby et al, "What Are the Best Methodologies for Rapid Reviews of the Research Evidence for Evidence-Informed Decision Making in Health Policy and Practice. A Rapid Review," *Health Research Policy and Systems* 14, no. 1 (2016): 83, <https://doi.org/10.1186/s12961-016-0155-7>.

Journal of Health & Pollution.ⁱⁱⁱ For all searches, the team used the following search terms: urban industrial facility permits, urban industrial facility, urban industrial activity, urban heavy or light industry, environmental health, pollution, local economic development, toxin exposure, neurological development, heat islands, respiratory conditions, and residential property values. The team also searched the National Institutes of Health, the National Environmental Health Association, the U.S. Centers for Disease Control and Prevention, and the District of Columbia Department of Health for additional resources outside the peer-reviewed literature. After following the above protocol, the team screened 192 titles and abstracts,^{iv} identified 18 abstracts for potential inclusion, and reviewed the full text corresponding to each of these abstracts. After applying the inclusion criteria, four articles were excluded. Six additional sources were identified upon review of the included articles. A final sample of 20 articles, including one systematic review with meta-analysis and four review articles, was used to create the health note. In addition, the team used 14 references to provide contextual information.

Of the studies included, the Health in All Policies Initiative qualitatively described and categorized the strength of the evidence as not well researched, mixed evidence, a fair amount of evidence, strong evidence, or very strong evidence. They adapted the evidence categories from a similar approach from Washington State.⁴⁷

- **Very strong evidence:** the literature review yielded robust evidence supporting a causal relationship with few, if any, contradictory findings. The evidence indicates that the scientific community largely accepts the existence of the relationship.
- **Strong evidence:** the literature review yielded a large body of evidence on the association, but the body of evidence contained some contradictory findings or studies that did not incorporate the most robust study designs or execution or had a higher-than-average risk of bias or some combination of those factors.
- **A fair amount of evidence:** the literature review yielded several studies supporting the association, but a large body of evidence was not established, or the review yielded a large body of evidence, but findings were inconsistent with only a slightly larger percentage of the studies supporting the association; or the research did not incorporate the most robust study designs or execution or had a higher-than-average risk of bias.
- **Mixed evidence:** the literature review yielded several studies with contradictory findings regarding the association.
- **Not well researched:** the literature review yielded few, if any, studies or yielded studies that were poorly designed, poorly executed, or had a high risk of bias.

Expert Reviewer

This document benefited from the insights and expertise of Mary A. Fox, Ph.D., MPH, Associate Practice Professor in the Department of Health Policy and Management at the Johns Hopkins Bloomberg School of Public Health. Although she reviewed the materials and found the approach sound, she does not necessarily endorse the health note's findings or conclusions.

ⁱⁱⁱ American Journal of Public Health, Social Science & Medicine, and Health Affairs were selected using results from a statistical analysis completed to determine the leading health research journals between 1990 and 2014 and in consultation with policing and criminal justice experts. Merigó, José M, and Alicia Núñez. (2016). "Influential Journals in Health Research: A Bibliometric Study." *Globalization and Health* 12.1, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4994291/>.

^{iv} Many of the searches produced duplicate articles. The number of sources screened does not account for duplication across searches in different databases.

¹ Summary as described by the Council of the District of Columbia, <https://lms.dccouncil.gov/Legislation/B25-0564>.

² Rachel Morello-Frosch, et al., “Understanding the cumulative impacts of inequalities in environmental health: implications for policy.” *Health Affairs* (Project Hope) 30, no.5 (2011): 879-87. doi:10.1377/hlthaff.2011.0153; Inês Paciência, et al., “Environmental inequality: Air pollution and asthma in children,” *Pediatric allergy and immunology* 33, no. 6 (2022): 10.1111/pai.13818. doi:10.1111/pai.13818; C. Wang et al., “Cool pavements for urban heat island mitigation: A synthetic review.” *Renewable and Sustainable Energy Reviews* 146 (2021): <https://doi.org/10.1016/j.rser.2021.111171>.

³ Rachel Morello-Frosch et al., “Understanding the cumulative impacts of inequalities in environmental health.”

⁴ Anil Nanda et al., “Air Pollution Effects in Allergies and Asthma,” *Immunology and allergy clinics of North America* vol. 42,4 (2022): 801-815. doi:10.1016/j.iac.2022.06.004; Paciência et al. “Environmental inequality”; World Health Organization, “Household Air Pollution,” (2023), [https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health#:~:text=The%20combined%20effects%20of%20ambient,\(COPD\)%20and%20lung%20cancer](https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health#:~:text=The%20combined%20effects%20of%20ambient,(COPD)%20and%20lung%20cancer); U.S. Environmental Protection Agency, “AirToxScreen Mapping Tool (based on 2020 emissions),” (2024) <https://experience.arcgis.com/experience/a0deb771dbcd40d0a46fbe83adc51747/>.

⁵ Thi Thuy Tien Vo et al., “Potential effects of noxious chemical-containing fine particulate matter on oral health through reactive oxygen species-mediated oxidative stress: Promising clues,” *Biochemical pharmacology* 182 (2020): doi:10.1016/j.bcp.2020.114286.

⁶ Eun Kyung Lee et al., “Health outcomes in redlined versus non-redlined neighborhoods: A systematic review and meta-analysis,” *Social science & medicine* 294 (2022): doi:10.1016/j.socscimed.2021.114696; Joseph L. Servadio et al., “Demographic Inequities in Health Outcomes and Air Pollution Exposure in the Atlanta Area and its Relationship to Urban Infrastructure,” *Journal of urban health: bulletin of the New York Academy of Medicine* 96, no.2 (2019): 219-234, doi:10.1007/s11524-018-0318-7; Paciência et al. “Environmental inequality.”

⁷ C. Wang et al., “Cool pavements for urban heat island mitigation.”

⁸ Antonio Ventriglio et al., “Environmental pollution and mental health: a narrative review of literature,” *CNS spectrums* 26, no.1 (2021): 51-61. doi:10.1017/S1092852920001303; Eun-hye Yoo et al., “Short-term exposure to air pollution and mental disorders: a case-crossover study in New York City,” *Environmental Research: Health* 1 (2022). Doi: 10.1088/2752-5309/ac6439.

⁹ Jessica Pykett et al., “Urban precarity and youth mental health: An interpretive scoping review of emerging approaches.” *Social science & medicine* 320 (2023): doi:10.1016/j.socscimed.2022.115619.

¹⁰ Paciência et al., “Environmental inequality.”

¹¹ Y. Xiong, K. Du, and Y. Huang, “One-third of global population at cancer risk due to elevated volatile organic compounds levels,” *npj Climate and Atmospheric Science* 7, no. 54 (2024): <https://doi.org/10.1038/s41612-024-00598-1>; Occupational Safety and Health Administration, “Toxic Metals,” (U.S. Department of Labor) <https://www.osha.gov/toxic-metals>, accessed July 4, 2024; U.S. Environmental Protection Agency, “AirToxScreen Mapping Tool (based on 2020 emissions),” (U.S. EPA: 2024) <https://experience.arcgis.com/experience/a0deb771dbcd40d0a46fbe83adc51747/>.

¹² Veronica A. Southerland et al., “Global urban temporal trends in fine particulate matter (PM_{2.5}) and attributable health burdens: estimates from global datasets,” *The Lancet Planetary health* 6, no. 2 (2022): doi:10.1016/S2542-5196(21)00350-8; Nanda et al., “Air Pollution Effects in Allergies and Asthma.”; Paciência et al., “Environmental inequality.”; C. Arden Pope 3rd et al., “Cardiovascular mortality and exposure to airborne fine particulate matter and cigarette smoke: shape of the exposure-response relationship,” *Circulation* 120, no. 11 (2009): 941-8, doi:10.1161/CIRCULATIONAHA.109.857888.

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- ¹⁴ Vo et al., "Potential effects of noxious chemical-containing fine particulate matter."
- ¹⁵ Paciência et al., "Environmental inequality."
- ¹⁶ Nanda et al., "Air Pollution Effects in Allergies and Asthma."
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- ¹⁸ C. Wang et al., "Cool pavements for urban heat island mitigation."
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- ²⁰ Climate Central, "Urban Heat Hot Spots," (Climate Matters, 26 July 2023), www.climatecentral.org/climate-matters/urban-heat-islands-2023.
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- ²² Servadio et al., "Demographic Inequities in Health Outcomes."
- ²³ Lee et al., "Health outcomes in redlined versus non-redlined neighborhoods."
- ²⁴ Helen V S Cole et al., "Adapting the environmental risk transition theory for urban health inequities: An observational study examining complex environmental risks in seven neighborhoods in Global North cities." *Social science & medicine* 277 (2021): doi:10.1016/j.socscimed.2021.113907.
- ²⁵ Pykett et al., "Urban precarity and youth mental health."
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- ²⁷ Yoo, "Short-term exposure to air pollution and mental disorders."
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- ³⁷ Emilia Calma, "The geography of environmental toxins in the District of Columbia," (D.C. Policy Center, 15 October 2020), <https://www.dcpolicycenter.org/publications/environmental-toxins/>.
- ³⁸ Calma, "The geography of environmental toxins in the District of Columbia."
- ³⁹ U.S. Centers for Disease Control and Prevention, "Most Recent Asthma State or Territory Data," (10 May 2023), https://www.cdc.gov/asthma/most_recent_data_states.htm; U.S. Centers for Disease Control and Prevention, "Most Recent National Asthma Data," (10 May 2023), https://www.cdc.gov/asthma/most_recent_national_asthma_data.htm.
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⁴¹ Calma, “The geography of environmental toxins in the District of Columbia.”

⁴² Randy Smith, “D.C.’s heat islands,” (D.C. Policy Center, 8 August 2017),
<https://www.dcpolicycenter.org/publications/urban-heat-islands/>.

⁴³ Marissa Kunerth, “Air Pollution Disproportionally Effects [*sic*] Washington, D.C. Neighborhoods,” (NASA, 2 February 2023), <https://appliedsciences.nasa.gov/our-impact/story/air-pollution-disproportionally-effects-washington-dc-neighborhoods>.

⁴⁴ Kunerth, “Air Pollution Disproportionally Effects [*sic*] Washington, D.C. Neighborhoods,”

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<http://sboh.wa.gov/Portals/7/Doc/HealthImpactReviews/HIR-2016-05-HB2969.pdf>.