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EPA-SAB-xx-xxx

The Honorable Michael Regan
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

10 Subject: Transmittal of the DRAFT Science Advisory Board report *Review of the Updated*
11 *Methodology of EPA's Environmental Justice Screen (EJScreen) Mapping and Screening Tool*
12 *(version 2.1)* dated July 30, 2023.

13 Dear Administrator Regan,

14

15 Please find enclosed the final report from the Scientific Advisory Board (SAB). The EPA's
16 Office of Environmental Justice and External Civil Rights (OEJECR) requested that the
17 SAB review the EPA's Environmental Justice Screen (EJScreen) mapping and screening
18 tool. The Agency seeks the review and advice from the SAB regarding the updated
19 EJScreen scientific methodology and calculations released publicly in October 2022, as well
20 as other aspects of the mapping tool calculations. EJScreen is an environmental justice
21 mapping and screening tool that provides EPA with a nationwide consistent approach for
22 combining environmental and demographic indicators to identify areas with potential
23 environmental justice (EJ) concerns. In response to the EPA's request, the SAB assembled
24 the SAB EJScreen Review Panel with subject matter experts to conduct the review.

25

26 The SAB EJScreen Review Panel met virtually to receive a briefing from the EPA on the
27 EJScreen mapping and screening tool on March 31, 2023. The SAB EJScreen Review Panel
28 met in-person on May 8-10, 2023 to deliberate on the Agency's charge questions and held
29 one videoconference on June 22, 2023 to review its integrated responses to the charge
30 questions. On August 14, 2023, the Panel met virtually to discuss their draft report. Oral and
31 written public comments were considered throughout the advisory process. This report conveys
32 the consensus advice of the SAB.

33

34 Overall, the SAB commends the EPA for the impressive detail included in the EJScreen mapping
35 and screening tool, as well as its scientific quality, functionalities, and ease of use in identifying
36 areas with potential environmental justice concerns. We appreciate the amount of effort and time
37 the EPA staff have invested in developing, refining, and advancing the tool. Many issues raised
38 in previous reviews regarding limitations of the tool and its methodologies have been considered

1 and addressed by the EPA. However, the SAB finds that EJScreen can be further enhanced in
2 several different ways as detailed in our review.

3 While the SAB provides a wide range of recommendations in this report to improve the
4 EJScreen tool in response to charge questions 1-16, we would like to highlight the following as
5 highest priority (in no particular order):

- 6 • The SAB recommends that the EPA better articulate its justification associated with
7 EJScreen indicators and methodology in the technical documentation, including data
8 sources, and revise other EJScreen support materials to improve the accessibility of this
9 documentation to a wider audience that comprises both technical and non-technical users.
- 10 • The SAB recommends that the EPA establish a systematic collaboration or workgroup
11 with other relevant federal agencies and state partners to discuss data resolution issues
12 and potential databases for inclusion of additional indicators in EJScreen.
- 13 • The SAB recommends that the EPA continue to implement its recently revised
14 calculations for the EJScreen tool, specifically the EJ and Supplemental Indexes.
15 However, the measurement of low-income should be reconsidered since the current
16 indicator does not account for geographic differences across the U.S.
- 17 • With respect to the use of percentiles and buffer analyses for representing the tool's
18 indicators, the SAB did not identify limitations that require immediate revisions.
19 However, several recommendations are provided to address issues related to comparisons
20 among locations, differences among demographic, socioeconomic, and environmental
21 factors summarized in the EJScreen indexes, and data uncertainty.
- 22 • The SAB recommends that the EPA include other currently available, nationally
23 consistent datasets relevant to issues impacting communities with environmental justice
24 issues, but not yet included in EJScreen.
- 25 • The SAB considers the threshold map to be a very significant improvement to the
26 EJScreen tool and recommends minor adjustments to improve its utility for an audience
27 that has many different needs. The EPA is recommended to provide options for
28 displaying data from external sources via a map service or GeoPlatform to help users
29 explore cumulative effects within the threshold maps.
- 30 • While the development of a cumulative score or index within EJScreen might not serve
31 its intended purpose at this time, the SAB strongly recommends that the EPA continue to
32 identify appropriate approaches for EJScreen to inform users of cumulative effects.
- 33 • The SAB does not support any systematic weighting scheme for combining
34 environmental indicators, as there is insufficient scientific basis for determining such
35 weights.
- 36 • The SAB recognizes that environmental justice issues in rural areas are significantly
37 different from those in urban areas and provides multiple recommendations for: (a)
38 defining rural areas in EJScreen; (b) identifying nationally consistent datasets for
39 documenting environmental justice issues specifically for rural communities; and (c)
40 enabling users to distinguish rural from urban areas in examining or exploring core
41 EJScreen indexes.

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1 As the EPA continues to improve their EJScreen tool, the SAB encourages the Agency to
2 address the concerns raised in the enclosed report and consider their advice and
3 recommendations.

4
5 The SAB appreciates this opportunity to review the updated methodology of the EJScreen
6 Mapping and Screening Tool and looks forward to the EPA's response to these
7 recommendations.

Sincerely,

Chair
EPA Science Advisory Board

Chair
EPA EJScreen Review Panel

8 Enclosure:
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NOTICE

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This report has been written as part of the activities of the EPA Science Advisory Board, a public advisory committee providing extramural scientific information and advice to the Administrator and other officials of the Environmental Protection Agency. The Board is structured to provide balanced, expert assessment of scientific matters related to problems facing the Agency. This report has not been reviewed for approval by the Agency and, hence, the contents of this report do not represent the views and policies of the Environmental Protection Agency, nor of other agencies in the Executive Branch of the Federal government, nor does mention of trade names or commercial products constitute a recommendation for use. Reports of the EPA Science Advisory Board are posted on the EPA website at <https://sab.epa.gov>.

The SAB is a chartered federal advisory committee, operating under the Federal Advisory Committee Act (FACA; 5 U.S.C. 10). The committee provides advice to the Administrator of the U.S. Environmental Protection Agency on the scientific and technical underpinnings of the EPA's decisions. The findings and recommendations of the Committee do not represent the views of the Agency, and this document does not represent information approved or disseminated by EPA.

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AUTHORING PANEL ROSTER
U.S. Environmental Protection Agency
Science Advisory Board
Environmental Justice Screen (EJScreen) Review Panel

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REVIEWING PANEL ROSTER

**Review of the Updated Methodology of EPA’s Environmental Justice Screen (EJScreen) Mapping and Screening Tool (version 2.1)
DRAFT REPORT, dated July 30, 2023**

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ACRONYMS AND ABBREVIATIONS

1	
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3	
4	ACS American Community Survey
5	AHRQ Agency for Healthcare Research and Quality
6	AHRF Area Health Resources Files
7	CDC Centers for Disease Control and Prevention
8	DOE Department of Energy
9	DOD Department of Defense
10	EJ Environmental Justice
11	EJMAP Environmental Justice Map Tool
12	ECHO Enforcement and Compliance History Online
13	EIA Energy Information Administration
14	EJScreen Environmental Justice Screening & Mapping Tool
15	ERS Economic Research Service
16	ESRI Environmental Systems Research Institute
17	FAR Frontier and Remote Area
18	FEMA Federal Emergency Management Agency
19	GIS Geographic Information Science
20	HUD U.S. Department of Housing and Urban Development
21	HRSA Health Resources and Services Administration
22	K-12 Kindergarten to 12 Grade Education
23	km Kilometer
24	ICD-10 International Classification of Diseases, tenth revision
25	MOE Margin of Error
26	NAAQS National Ambient Air Quality Standards
27	NANDA National Neighborhood Data Archive
28	NAS National Academy of Sciences
29	NCHS National Center for Health Statistics
30	NCUP Healthcare Cost and Utilization Project
31	NDI National Death Index
32	NHANES National Health and Nutrition Examination Survey
33	NLCD National Land Cover Database
34	NOAA National Oceanic and Atmospheric Administration
35	NPL National Priority List
36	OEJECR Office of Environmental Justice and External Civil Rights
37	PCA Principal Component Analysis
38	PLACES Population-Level Analysis and Community Estimates of Health
39	PM Particulate Matter
40	ppb Parts Per Billion
41	RMP Risk Management Program
42	RUCA Rural Urban Continuum Codes
43	RUCC Rural-Urban Commuting Area Codes
44	SAB Science Advisory Board
45	SVI Social Vulnerability Index
46	SWD Salt-Water Disposal
47	U.S. United States of America
48	USDA U.S. Department of Agriculture

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- 1 U.S. EPA U.S. Environmental Protection Agency
- 2 USGS U.S. Geological Survey
- 3 U.S. SEC U.S. Securities and Exchange Commission
- 4 UST Underground Storage Indicator
- 5 YMCA Young Men's Christian Association

1. INTRODUCTION

The U.S. Environmental Protection Agency (EPA) has developed the Environmental Justice Screen (EJScreen) screening and mapping tool. The EPA’s Office of Environmental Justice and External Civil Rights (OEJECR) requested the review and advice from the SAB regarding the updated EJScreen scientific methodology and calculations released publicly in October 2022, as well as other aspects of the mapping tool calculations. EJScreen is an environmental justice mapping and screening tool that provides EPA with a nationwide consistent approach for combining environmental and demographic indicators to identify areas with potential environmental justice (EJ) concerns.

The SAB was charged with providing expert input on the EJScreen methodology and updated calculations for the EJ Indexes and other components of the tool including, but not limited to, the use of percentiles, representation of the scores, buffer analysis, and methods to consider multiple geographies.

The SAB Staff Office formed the EJScreen Review Panel composed of subject matter experts with demonstrated expertise in the following disciplines and research topics: applications of geographic information science (GIS), including mapping and geospatial analyses; cartography; environmental justice tools; index development; modeling; screening tools; environmental pollution; environmental economics; sociology; exposure assessment; environmental indicators; demographics; spatial mathematics or analysis; statistics and coding; and individuals with demonstrated experience working with overburdened and vulnerable communities, or communities with environmental justice concerns. The Panel held its first public video conference on March 31, 2023, followed by an in-person (and hybrid) meeting on May 8-10, 2023. The Panel also held public videoconferences on June 22, 2023 to discuss their integrated responses to charge questions, and on August 14, 2023 to discuss their draft report.

The EJScreen Review Panel was convened to conduct the review. This review provides feedback to the EPA on five topic categories: (1) Scientific Defensibility and Logic of the EJScreen Calculations, (2) Technical Accuracy of the EJScreen Methodology, (3) Recommendations on the Demographic and Environmental Considerations in the EJScreen Equations, (4) Advice on the Incorporation of Cumulative Impacts and Scoring, and (5) Input on Better Consideration of Rural Geographies within EJScreen. Oral and written public comments have been considered throughout the advisory process.

This report is organized by topic category and states each charge question raised by the Agency followed by the SAB’s consensus response and recommendations. Recommendations are prioritized to indicate relative importance during EPA’s revisions. Prioritizes are defined as follows:

- Tier 1: Major – Actions that are necessary to improve the critical scientific concepts, issues and/or narrative within the tool/assessment/document/model/guidelines.
- Tier 2: Short-term – Actions that are strongly encouraged in a timely manner to strengthen scientific concepts, issues and/or narrative within the assessment/document/model/guidelines. Other factors such as the Agency’s needs and resources should be considered before undertaking these revisions.

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- 1 • Tier 3: Future Considerations – Useful and informative scientific exploration that may inform
2 future evaluations of key scientific issues and/or the development of future versions of the tool/
3 assessments/documents/models/guidelines. These recommendations are likely outside the
4 immediate scope and/or needs of the current review and may require additional research
5 activities and/or intra- or inter-agency collaboration.
6

7 All materials and comments related to this report are available on the SAB website at: [advisory activity](#)
8 [page](#).
9

2. RESPONSE TO CHARGE QUESTIONS

2.1. Topic 1: Scientific Defensibility and Logic of the EJScreen Calculations (Charge Questions: 1, 2, 3, and 4)

The SAB commends the EPA for the impressive detail included in the EJScreen mapping and screening tool, as well as its scientific quality, and ease of use. Many issues on appropriate use and known limitations of the tool have been clearly considered and documented by the EPA. The amount of effort and time the EPA staff have invested in developing, refining, and improving the tool should be commended.

The SAB agrees that the EPA should continue to use its revised calculations for the EJScreen tool, specifically the EJ and Supplemental Indexes. The SAB finds the methodology to be logical and scientifically defensible. The SAB agrees that the updated calculation changes regarding population weighting, subtraction of national demographic scores, environmental percentiles, and the rounding of scores are improvements from the prior approach.

The SAB provides several recommendations to enhance the tool including specific areas where the EPA should better articulate its justification for the methodology in the technical documentation and other EJScreen support materials for different audiences, including technical and non-technical users. The SAB also notes other areas to improve the tool as presented below.

2.1.1. Charge Question 1: *The EJScreen EJ and supplemental indexes are designed to examine the intersection of environmental pollution and community vulnerability. Please comment on whether the calculations achieve this goal using a method that is logical, clearly articulated, and scientifically defensible? Do you have any specific suggestions for how to improve the calculations?*

EJ Index and Supplemental Index Calculations

The SAB finds that the current calculations for the EJ Index and Supplemental Index effectively examine the intersection of environmental pollution and community vulnerability. The SAB agrees that the index calculation methodology is logical, clearly articulated, and scientifically defensible, and that this methodology is sufficiently explained in the EJScreen technical documentation. The recent modifications made to the calculations regarding the removal of population weighting, the subtraction of national demographic scores, and changes to environmental percentiles are improvements from prior approaches. Regarding population weighting, the SAB finds that population weighting may still be informative in some circumstances as a way to highlight more populated areas where improvements toward environmental justice may benefit more people.

The SAB finds that the change to the rounding of scores is appropriate and provides a more intuitive approximation. The calculations related to the proximity to traffic are useful indicators, which include descriptions of different distances used in the literature and their exposure zones for health impacts, including traffic volume and distance. Additionally, descriptions of calculations related to particulate matter 2.5 (PM_{2.5}) and ozone provide limitations of the data and models published in the literature, which also support EPA's justifications for using specific algorithms and models.

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1 For the air pollution indicators (e.g., PM_{2.5}, Ozone, Diesel PM) included as environmental indicators, the
2 SAB finds that additional clarification is needed about how the decision was made to focus on the
3 average concentrations as opposed to some other metrics with more public health implications (e.g., the
4 % days with air pollution levels exceeding the National Ambient Air Quality Standards (NAAQS)
5 standards). The SAB notes that the usage of average concentrations should be justified and included in
6 the technical documentation. The SAB also notes that in some cases the usage of average concentrations
7 without considering health-based environmental quality standards could introduce difficulty for
8 interpretation. For example, for Ozone, the NAAQS standard is 70 parts per billion (ppb) while the raw
9 value ranges from 24.6 to 74.4 ppb, which means that most census block groups, despite having a high
10 percentile ranking, are still lower than the NAAQS standard. To address this challenge, the SAB offers
11 some alternative methods to calculate the percentiles for the EPA to consider, such as middle-anchoring
12 the 50th percentile to correspond to the health-based limit.

13 14 Supplemental Index Indicators

15
16 The SAB agrees that, generally, calculations are based on basic arithmetic equations, distance weighted
17 calculations for certain indicators, and modeling approaches for other indicators. Each of these
18 approaches are logical, clearly articulated, and scientifically sound. However, there are some questions
19 about the specific indicators that the EPA included in the Supplemental Index. The Supplemental Index
20 includes five socioeconomic measures: low life expectancy, poverty, unemployment, limited English
21 speaking, and education. The SAB finds that adequate justification for the inclusion of these indicators
22 is lacking. The SAB seeks clarification about why age-related variables are included in EJScreen as
23 separate socioeconomic indicators but are excluded from the Supplemental Index given evidence that
24 young and older populations are especially susceptible to many types of environmental exposures
25 ([Research on Health Effects from Air Pollution | US EPA](#)). The SAB recommends that the EPA provide
26 rationale for why these five demographic factors were chosen to construct the Supplemental
27 Demographic Indexes. The SAB finds that a parallel rationale section would be helpful for the
28 demographic and socioeconomic indicators, similar to what is already included on page 23 of the
29 EJScreen technical documentation (e.g., the EPA should list their considerations for the selection of
30 demographic and socioeconomic indicators, similar to the environmental indicators).

31 32 Additional Indicators to Consider

33
34 [Executive Order 14096](#) on *Revitalizing Our Nation's Commitment to Environmental Justice for All*
35 identifies people with disabilities as a population group that should be considered as part of the
36 definition of environmental justice. In recognition of this updated definition, the SAB suggests that the
37 EPA should consider adding disability status to the Supplemental Index.

38
39 Relating to air pollution indicators, the SAB finds that the EPA could consider updating the air pollution
40 data from the census tract level to other sources at finer spatial resolution such as 1 kilometer (km) by 1
41 km grid (such as Di et al., 2019 for PM_{2.5} and Di et al., 2017 for Ozone), as these are used extensively in
42 environmental epidemiological research. The SAB recommends that the EPA explore the possibility of
43 using modeled air pollution levels if they can provide more granular results.

44
45 Regarding climate, the SAB notes that the EPA should consider including calculations for the EJ Index
46 and supplemental scores for climate measures, given that vulnerability to climate is increasingly
47 important. The SAB recommends that the EPA consider adding a measure of excessive heat days or
48 heatwave risk to EJScreen.

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Furthermore, the SAB notes that the EPA should consider including violations data from EPA's Enforcement and Compliance History Online (ECHO) into EJScreen, at least for major sources of pollution sources regulated under laws such as the Clean Air Act, Clean Water Act, Resource Conservation and Recovery Act, and the Safe Drinking Water Act.

Income Measurement

The SAB notes that there are some questions about the current measurement of low-income, which is an indicator utilized in both the EJ Index and the Supplemental Index. The current indicator for low-income is the percentage of the population in a block group with income that is less than or equal to twice the federal poverty level threshold. The SAB first notes that the impact of percent low-income may not be linear (e.g., individuals with a Ratio of Income to Poverty of 1.0 vs. 2.0, may be multiple times more susceptible than what a factor of 2.0 implies). Moreover, the federal poverty measure is adjusted annually, but it is the same across the country (e.g., only Alaska and Hawaii have different values), which is potentially problematic given vast differences in the cost of living across and within regions. The EJScreen's technical documentation (page 7) notes that the EPA uses twice the poverty guideline to address differences in income across the country. The SAB finds that the use of a single value may result in a mischaracterization of income, as both upward and downward biases are possible. As an example, the poverty guideline of \$52,992 for a family of four living in New York compared to a small county in the Midwest/Central U.S. is not an equal comparison. Despite doubling the standard poverty guideline, and taking into account the cost of living, the concept of a uniform low-income may not be appropriate.

Therefore, the SAB offers the following alternative measures that the EPA might consider to better inform an income measurement: including 80% of the area median income, an indicator of wealth such as home ownership, median home value, or a weighted income calculation. The SAB finds that 'income' deserves more scrutiny because of its impact on all aspects of a person's quality of life, from nutrition to health care to education.

Demographic and Supplemental Demographic Index

The SAB recommends that the EPA clarify the relationship between the individual socioeconomic indicator and the demographic and supplemental demographic index. At the beginning of the EJScreen technical documentation, there are seven socioeconomic indicators. These indicators are different from what was used in the demographic and supplemental demographic index. For example, percent of individuals under age 5 and percent of individuals over age 64 are not used in the demographic and supplemental demographic index; low life expectancy is used in the supplemental demographic index but not listed as one of the seven socioeconomic indicators. The SAB suggests that the EPA clarify its rationale for which demographic indicators are included in the Supplemental Index in the EJScreen technical documentation and in other EJScreen supporting materials.

Recommendations:

Tier 1 (Major):

- The SAB recommends that the EPA continue to use its revised calculations for the EJScreen tool, specifically the EJ and Supplemental Indexes.

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- The SAB recommends that the EPA better articulate its justification for the inclusion of specific indicators in the Supplemental Index in its technical documentation and other EJScreen support materials.
- The SAB recommends that the EPA reconsider its measurement of low-income. The current measure of low-income used in EJScreen is twice the federal poverty level. The SAB believes that this representation of low-income does not adequately capture geographic differences in income across various regions of the country.
- The SAB finds that some important factors impacting vulnerability are not included in the current EJ and Supplemental Indexes. For example, age has important implications on health vulnerability. The SAB recommends that the EPA consider adding younger and older age to the Supplemental Index.

Tier 2 (Short-term):

- The SAB suggests that the EPA consider adding disability status to the Supplemental Index given its inclusion as part of the environmental justice definition in the Executive Order 14096 on *Revitalizing Our Nation’s Commitment to Environmental Justice for All*.

Tier 3 (Long-term):

- The SAB finds that the removal of population weighting is an improvement over the previous methodology, but that the EPA should consider offering population weighting as an option in EJScreen. In certain use cases, population weighting may be useful to highlight communities where improvement in environmental justice can benefit more people.
- The SAB concludes that the weighting of indicators is not currently feasible due to lack of scientific evidence and that the EPA should continue to assess the impact of indicators to confirm that the most impactful indicators are being used in EJScreen and in the calculation of all Indexes.

2.1.2. Charge Question 2: *The EJ and supplemental indexes are designed to examine the intersection of environmental pollution and community vulnerability. Please comment on whether the calculations produce intuitive and expected results towards that goal?*

Results Produced by EJScreen

The EJ Index and Supplemental Index provide intuitive and expected results in representing the geographic intersection of environmental pollution and community vulnerability (i.e., socioeconomic indicators). The SAB acknowledges that this is a difficult intersection to fully assess, since it requires detailed knowledge of local circumstances and local perceptions of vulnerability.

One strategy to systematically evaluate how well EJScreen performs is to conduct “ground-truthing” exercises in specific communities to analyze the “match” between the tool’s calculations and actual conditions or lived experiences on the ground. This type of exercise should be completed in close coordination with communities, and in the long-term this exercise could provide an opportunity for the communities to provide local data inputs and recommendations into EJScreen. The SAB encourages the EPA to document these “ground-truthing” exercises and present them as case studies.

Other strategies to assure that the tool produces intuitive and expected results is to carefully evaluate how EJScreen characterizes communities over time through data and methodological updates to EJScreen. The SAB also suggests that the EPA compares community characterizations from EJScreen with those from state-level tools, where available, as a way to identify the results produced by EJScreen.

Life Expectancy as Socioeconomic Indicator

The SAB finds that the inclusion of life expectancy as a socioeconomic indicator in the Supplemental Index complicates its interpretation. Low life expectancy is not a socioeconomic indicator, but rather an outcome that may be impacted by several factors including health burdens resulting from environmental exposures. The EJScreen technical documentation justifies the inclusion of life expectancy based on the former interpretation, which raises questions about why additional measures of health burden are also not included. Under the latter interpretation, the SAB suggests that life expectancy should be excluded as an indicator from the Supplemental Index, and included as an additional index calculation, or at minimum, the EPA should provide a more comprehensive justification about the inclusion or exclusion of health burden measures in the technical documentation.

Recommendations:

Tier 1 (Major):

- The SAB recommends that the EPA reconsider and further justify the selection of socioeconomic indicators included in the Supplemental Index, and specifically the measure of a health outcome such as low life expectancy. The SAB recommends that the EPA consider removing low life expectancy from the Supplemental Index, and perhaps moving low life expectancy to a separate list or adding more health indicators to the Supplemental Index.

Tier 2 (Short-term):

- The SAB recommends that the EPA consider conducting empirical analyses across methodological updates to EJScreen to identify communities with considerable changes in EJ Index and Supplemental Index between versions. The EPA should also consider conducting empirical analysis between EJScreen and state-specific environmental justice screening tools to assess alignment of the same community's score across different platforms/tools.

Tier 3 (Long-term):

- The SAB suggests that the EPA invest in systematically “ground-truthing” key environmental inputs utilized in the EJ and Supplemental Indexes to ensure that the percentile scores created in the calculations reflect situations that individuals, households, and communities themselves experience. Ground-truthing is best accomplished by selecting a variety of location types, including urban and rural examples. The SAB encourages the EPA to document this “ground-truthing” effort and present it as case studies. A systematic ground-truthing effort also has the potential benefit of providing communities with opportunities to provide additional information for inclusion in EJScreen. The SAB notes that one important consideration is for the EPA, in collaboration with states, to provide technical infrastructure and related resources to support communities in the “ground-truth” activity, and to avoid putting extra burden on the communities.

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1 **2.1.3. Charge Question 3: *EJScreen combines environmental and socioeconomic information into***
2 ***EJ and supplemental indexes to examine the intersection of vulnerable communities and***
3 ***pollution. Please comment on whether the use of both EJ and supplemental indexes in***
4 ***EJScreen is logical, whether the differences between these indices are clearly documented,***
5 ***and whether the documentation clearly indicates why both of these indices are used in the***
6 ***tool?***

7
8 Use and Rationale for EJ and Supplemental Indexes
9

10 The EJScreen employs two indexes to represent the intersection of environmental and socioeconomic
11 information. The EJ Index includes a demographic index that combines measures of people of color and
12 poverty with an environmental indicator, whereas the Supplemental Index includes an index that
13 combines measures of low life expectancy, poverty, unemployment, limited English speaking, and
14 education with an environmental indicator. In so doing, EJScreen presents information on environmental
15 pollution and community vulnerability in two different ways, which the SAB observes can produce
16 some different results in specific locations.

17
18 The SAB agrees that the use of both the EJ Index and the Supplemental Index is logical, and that the
19 differences between the indexes are clearly explained by the EPA in its technical documentation and
20 other support materials (e.g., the EJScreen website). However, while the EPA clearly explains the
21 distinction between the indexes, the SAB finds that the justification for having two indexes is less
22 obvious. The technical documentation (page 26) provides a clear justification for the use of income and
23 people of color as part of the Demographic Index used in the EJ Index, but the rationale for the
24 Supplemental Index is less specific. The technical documentation (page 29) notes that the Supplemental
25 Index may be more appropriate than the EJ Index for decision-making, but few details are provided.
26 Moreover, this decision-making rationale is only applicable to the EPA (and perhaps state and local
27 agencies) and does not provide much guidance for other EJScreen users.

28
29 As part of any rationale for maintaining two separate indexes, the SAB finds that it is important for the
30 EPA to consider meaningful differences in outcomes. If the indexes produce similar results (e.g.,
31 comparable national or state percentile rankings for each environmental indicator), then keeping two
32 indexes is less appropriate. However, if the indexes produce divergent results, the implications for how
33 and when each indicator should be used needs to be considered. The SAB finds that adequate
34 justification should also be provided for why the percent low-income is used in both the Demographic
35 and the Supplemental Demographic Indexes. The overlap makes it harder for the user to understand why
36 the two indexes are different. Currently, the difference between the EJ and Supplemental Indexes is
37 mainly on the demographic side, which poses the question of why not on the environmental side as well
38 (e.g., having an expanded list of environmental indicators even though they may only meet some but not
39 all of the selection criteria related to resolution, coverage, relevance, and public health significance).

40
41 As part of an effort to refine the rationale for two indexes and guidance as to when one index should be
42 used instead of another, the SAB concludes that the EPA should rename the indexes with labels that are
43 more intuitive. Both indexes are “EJ Indexes” in their intent, they just use different indicators.

44
45 The SAB also suggests that more information be provided within the EJScreen tool itself to explain the
46 differences between the EJ Index and Supplemental Index, including guidance about for what purpose a
47 user should use each index. Furthermore, the SAB recommends numerous additional socioeconomic and

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1 environmental indicators that could be included in EJScreen, and these suggestions are discussed
2 extensively in responses to other charge questions.

3 4 Intersection of Vulnerable Communities and Pollution

5
6 The SAB also notes additional areas for the EPA to consider related to the EJ and Supplemental Indexes
7 when examining the intersection of vulnerable communities and pollution, as described below.

8 9 *Groundwater Contamination*

10
11 An important aspect of environmental pollution is water contamination. Based on information provided
12 to the SAB by the EPA during the public meeting on March 31, 2023, there are ongoing efforts to
13 include data on water quality into the EJScreen Tool (e.g., the incorporation of violations data on
14 drinking water). The SAB commends the EPA for these efforts and suggests that these efforts include
15 groundwater quality. The SAB notes that in the Western United States and in many rural areas,
16 groundwater is the main water source and is seldom regulated. Therefore, groundwater pollution, or
17 seawater intrusion into aquifers for coastal regions, can be a critical environmental justice issue. The
18 SAB suggests that the EPA consider adding groundwater quality to the toolbox and/or list of main EJ
19 Indexes.

20 21 *Borderlands*

22
23 The SAB finds that U.S.-Mexico border regions are not well represented in EJScreen. For example,
24 some communities suffer from sewage spills regularly in these locations (e.g., case of Nogales,
25 Arizona). Since sewage spills are not listed on the tool as pollution sources, the SAB encourages the
26 EPA to explore these types of events such as spills, that may affect border communities as they may be
27 considered “fenceline communities” in the context of the tool.

28 29 *Wastewater Discharge in Arid Lands*

30
31 The SAB notes that in the desert, having treated wastewater discharged into the rivers is valuable in arid
32 lands. This type of wastewater discharge is clean and has enabled the existence of riparian ecosystems
33 and the thriving of communities. Therefore, this event is not considered an environmental justice issue
34 (e.g., area north of Nogales). The SAB encourages the EPA to complete some case studies related to
35 wastewater discharge to ensure it is highlighting the areas as intended.

36 37 *Aging Infrastructure*

38
39 The SAB notes the issue of lack of inclusion or acknowledgment of aging infrastructure within the tool,
40 particularly as it relates to drinking water. The SAB encourages the EPA to explore this issue within the
41 context of the tool.

42 43 *Landfills*

44
45 The SAB notes that a factor not considered in the tool is landfills and solid waste transfer stations. The
46 SAB believes that the EPA should explore the incorporation of landfills information into the tool.

1 *Heat*

2
3 The SAB finds that climate-related events or hazards that affect minorities disproportionately should be
4 included in the tool. The SAB recommends that the EPA includes heat as an indicator. The SAB notes
5 that heat as an indicator could be combined with other indicators (e.g., lack of air-conditioning or
6 vegetation) that could exacerbate this threat.

7
8 **Recommendations:**

9
10 **Tier 1 (Major):**

- 11
- 12 • The SAB recommends that the EPA update the EJScreen technical documentation to better justify
13 the rationale for the calculations used in the Supplemental Index, including the choice of indicators
14 for inclusion and exclusion.
 - 15
16 • The SAB recommends that the EPA articulate in its technical documentation for what purposes the
17 EJ Index should be used and for what purposes the Supplemental Index should be used, recognizing
18 that EJScreen has multiple user types. The EPA should also continue to emphasize the importance of
19 EJScreen as a screening level tool.

20
21 **Tier 2 (Short-term):**

- 22
- 23 • The SAB recommends that the EPA update the EJScreen technical documentation, specifically the
24 terminology around the EJ and Supplemental Indexes to ensure it is clear and consistent. As part of
25 these updates, the EPA should reconsider the labeling of the indexes, so they are more intuitive to
26 multiple user types.

27
28 **Tier 3 (Long-term):**

- 29
- 30 • The SAB suggests that the EPA carefully compare calculations of the EJ and Supplemental Indexes
31 to identify areas of divergence and to use that comparison to inform when each index should be used
32 by different users.

33
34 **2.1.4. Charge Question 4: Please comment on whether the EJ and supplemental index**
35 **calculations use an appropriate balance of socioeconomic and environmental**
36 **considerations in the equations? Do you have recommendations on how they could be**
37 **improved?**

38
39 **Balance between Socioeconomic and Environmental Factors**

40
41 The current calculations in EJScreen’s EJ Index and Supplemental Index give equal weight to
42 socioeconomic and environmental considerations. In general, the SAB finds this to be a reasonable
43 approach that provides users with a clear and intuitive score (displayed in percentiles) for comparing
44 block groups. The SAB recommends that the EPA continuously evaluate other sources of data,
45 particularly from federal agencies, to incorporate additional, nationally consistent, and relevant
46 socioeconomic and environmental information into EJScreen.

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1 Although the SAB finds the use of equal weights scientifically defensible, additional indicators should
2 be incorporated to better represent rural geographies and Native American and/or Indigenous
3 communities. In addition, the SAB recommends the separation of “people of color” into distinct racial
4 and ethnic groups using categories already available in the Census Bureau’s American Community
5 Survey (ACS). The SAB notes that these categories can be viewed in EJScreen now, although they are
6 not part of the indexes.

7
8 In addition, as noted in response to Charge Question 1, the SAB recommends the inclusion of additional
9 health indicators in the socioeconomic component of the Supplemental Index or in an additional Index
10 such as a Health Index. The SAB also recommends that the EPA explore the possibility of adding
11 environmental and climate indicators (as enumerated elsewhere in this document) to the tool.

12
13 The SAB notes that a good first step will be for the EPA to ascertain whether susceptible communities
14 are being missed by EJScreen, and if so why. A similar approach could be taken for EJ calculations
15 related to potential exposures. It is important to identify which environmental considerations are
16 missing. See related comment under Charge Question 2.

17
18 Another issue in the balance of socioeconomic and environmental data is lack of available data that meet
19 the requirements for inclusion in EJScreen (e.g., data may not be available at the block group level). The
20 SAB recognizes that the EPA has more access to and in-depth knowledge of its own environmental data
21 and indicators and that environmental data from other agencies may not be as readily available. For
22 example, U.S. Department of Agriculture (USDA) environmental data relevant to rural areas are
23 lacking. Similarly, additional socioeconomic or health indicators that could be useful (e.g., infant
24 mortality, etc.), are not available at the geographic scale that allows inclusion in EJScreen. Therefore,
25 the SAB recommends further systematic review of other agencies’ databases for inclusion in EJScreen
26 and documentation of such efforts to increase the transparency and integrity of the activities/updates of
27 the tool.

28 29 Health Data

30
31 As mentioned above, the SAB encourages the EPA to explore adding some of the health disparities data
32 to the supplemental demographics index. Although the SAB recognizes that some of these data are not
33 available at a block group level, given that EJScreen currently includes three health indicators (i.e., low
34 life expectancy, cardiovascular disease, and asthma), the SAB notes that there may be opportunities to
35 further expand the existing list of health indicators. Exploring other health conditions available through
36 the Centers for Disease Control and Prevention’s (CDC) Environmental Public Health Tracking
37 platform may be a potential approach. There are other data sources on the health indicators as well,
38 primarily provided by other federal agencies such as the Agency for Healthcare Research and Quality’s
39 (AHRQ) healthcare cost and utilization project (HCUP) and Health Resources and Services
40 Administration’s (HRSA) Area Health Resource Files (AHRF). HCUP is one of the largest publicly
41 available all-payer healthcare databases designed to produce area-level estimates of healthcare
42 utilization, access, cost, quality, and outcomes. It can be used to investigate a broad range of health
43 outcomes using the International Classification of Diseases, tenth revision (ICD-10) codes. Area Health
44 Resources Files (AHRF) contains information on the healthcare profession, health facilities, and
45 population characteristics, and would be useful to provide information on access to healthcare resources.
46 Both HCUP and AHRF are updated on an annual basis. The SAB recommends establishing a systematic
47 collaboration with other federal agencies and state partners to discuss data resolution issues and potential
48 databases for inclusion of health indicators into EJScreen.

1
2 Green Spaces
3

4 The SAB notes that a few metrics are not included in the toolkit. For urban communities, access to green
5 space is an issue of environmental justice. As a result, the SAB finds that the EJScreen tool should
6 include “proximity to green spaces” or “lack of green spaces” as an indicator.
7

8 Environmental Crime
9

10 The SAB notes that environmental crime could also be viewed as an indicator of environmental justice.
11 The EPA released a memorandum “[Strengthening Environmental Justice Through Criminal](#)
12 [Enforcement](#)” (dated June 21, 2021) on the need to strengthen tools for the detection of environmental
13 crimes in overburdened communities. Consequently, the information collected from the criminal
14 enforcement program can further environmental justice by strengthening current tools. The EPA should
15 consider including an indicator that identifies where environmental crimes are occurring.
16

17 Indigenous Communities
18

19 The SAB notes that environmental issues affecting federally recognized tribal lands are not well
20 represented in the tool. The EPA should consider including tribes and indigenous peoples as part of the
21 socioeconomic data and not only as a place or as an additional demographic group. For example, Native
22 American or Indigenous communities (e.g., Navajo Nation) live in sparsely populated areas, including
23 disproportionate proximity to radioactive materials (e.g., waste from uranium mines). In some cases,
24 groundwater is the only water source and is polluted with uranium and arsenic. Consequently, they need
25 to haul potable water for many miles for their daily activities. They cannot use their groundwater for
26 farming or livestock, so they need to also haul food from far away. Furthermore, the Navajo Nation is
27 only flagged under the Ozone EJ Index, which does not accurately capture their level of vulnerability. It
28 is unclear whether this type of environmental justice issue for tribes and indigenous peoples is
29 represented in EJScreen.
30

31 Rural Communities
32

33 The SAB notes that when identifying vulnerable rural communities, additional measures of healthcare
34 access from CDC’s Population-level Analysis and Community Estimates of Health (PLACES), as well
35 as additional measures that gauge lack of access to other resources would be a good improvement (e.g.,
36 lack of access to food and to other social/community resources from the USDA food access and
37 National Neighborhood Data Archive (NANDA) datasets noted above, respectively). Other related
38 comments on this issue are included in the responses to charge questions for Topic Category 5.
39

40 **Recommendations:**
41

42 **Tier 1 (Major):**
43

- 44 • The SAB recommends that the EPA continue to review datasets from other federal agencies, such as
45 the USDA and CDC, to identify potential additional indicators that could complement the current
46 Supplemental Index indicators.
47

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- The SAB recommends establishing a systematic collaboration with other relevant federal agencies and state partners to discuss data resolution issues and potential databases for inclusion of additional indicators in EJScreen.
- Because the use of weighting factors for indicators is so complex and not currently feasible, the SAB recommends that the EPA should maintain its use of equal weighting of socioeconomic and environmental indicators as part of the EJ and Supplemental Index calculations.

Tier 2 (Short-term):

- The SAB recommends that the EPA consider adding more indicators to better capture rural geographies, Native American or Indigenous communities, and specific racial and ethnic groups. However, when adding indicators to the demographic and supplemental demographic index, EPA should take extra caution that differences in one indicator do not dilute the contribution of other indicators in the Indexes.
- The SAB recommends that the EPA consider the inclusion of additional indicators and Indexes, such as a Health Disparities Index, as part of future updates of EJScreen. This effort should be done in collaboration with other federal agencies and state partners who have access to data and are developing similar data tools.

Tier 3 (Long-term):

- There are no long-term recommendations for this question.

1 **2.2. Topic 2: Technical Accuracy of the EJScreen Methodology** (*Charge Questions: 5, 6, and 7*)

2 The SAB has examined charge questions that revolve around the issue of accuracy and scientific
3 plausibility for some of the methodologies implemented within EJScreen. In particular, the SAB was
4 asked to comment on two major changes with respect to a previous version of EJScreen, namely the use
5 of percentiles instead of population-weighted indicators to compare locations across the state or the
6 nation, and the derivation of indicators when performing buffer analyses.

7
8 The SAB commends the EPA for having worked on the recommendations raised in previous reviews
9 and have found and implemented solutions that are scientifically sound and appropriate. With respect to
10 the major methodological innovations relative to the use of percentiles and buffer analyses, the SAB has
11 not identified major limitations that require immediate revisions. However, recognizing the complexity
12 of the problem and the desire and need to be able to capture the multiple factors and nuances that
13 contribute to environmental burdens and environmental injustice, the SAB provides several
14 recommendations that address issues related to comparisons among locations, differences between rural
15 and urban populations, differences among social, demographic and environmental factors that are
16 summarized in EJScreen indexes and indicators, uncertainty in the data, etc.

17
18 The SAB also provides several major recommendations to revise the technical documentation in an
19 effort to improve the accessibility of the documentation to a wider audience.
20

21 **2.2.1. Charge Question 5: *EJScreen represents the tool's indexes and indicators as percentiles to***
22 ***show how a given location compares to the rest of the state or nation. Please comment on***
23 ***whether the methodology for use of percentiles to represent the various scores is logical,***
24 ***clearly articulated, and scientifically defensible?***

25
26 The environmental, demographic, and social variables that are used to calculate the indices and
27 indicators employed in EJScreen all display significant spatial variability and, very often, are
28 characterized by distributions that are neither symmetric nor normal. To enable comparisons between
29 EJScreen indicators and indexes at different locations within a state or the U.S. some form of
30 “standardization” is needed. The SAB recognizes and agrees that percentiles are a good solution,
31 scientifically defensible (Raftery, 2016), and, perhaps, the most logical solution in this situation.
32

33 With respect to the appropriateness of the percentiles, members observed that while potential approaches
34 for standardization involve either deriving a z-score or considering percentiles, the use of z-scores, that
35 is, the number of standard deviations a certain value is above or below the mean, is not recommended
36 when a variable does not follow a symmetric distribution. Given that environmental, demographic, and
37 social factors are often characterized by non-symmetric distributions, the use of percentiles as an
38 approach to compare different locations is likely the most appropriate choice for this purpose.
39

40 The use of percentiles to compare locations with respect to EJScreen indexes and indicators is also
41 scientifically supported by the adoption of such methodology in other environmental justice mapping
42 tools. A review conducted by Konisky et al. (2021) indicates that of the 19 state or local environmental
43 justice mapping tools reviewed, 10 employed percentiles to either derive environmental justice indices
44 and/or to enable comparisons among locations or areal units.
45

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The SAB expresses wide support for the use of percentiles and provides several recommendations for the EPA’s consideration. The SAB recognizes that some recommendations are more quickly implementable than others.

Recommendations:

Tier 1 (Major):

- As the SAB concurs with the use of percentiles, there are no major recommendations for this question.

Tier 2 (Short-term):

- **Improve the interpretability of the EJScreen indices and indicators for the intended users of the tool: local communities.**

While the adoption of percentiles to enable comparisons between EJScreen indexes and indicators at different locations is justifiable, the SAB describes several issues related to clarity and ease with which the intended users of the tool, local communities, could interpret the results provided by EJScreen. The SAB recommends that the EPA focus on the following actions to improve interpretability:

- **Improve the interpretation of percentiles provided in the technical documentation.**

The SAB recommends eliminating text that is unnecessarily confusing and disorienting, and possibly developing clear, easy-to-understand, illustrative examples, perhaps with visual explanations, that could be more easily understood by a non-technical user audience. The SAB provides a specific example that the EPA could use as a template in this effort (i.e., the example where the Underground Storage Indicator (UST) variable and the UST indicator were discussed; see page 22 of the technical documentation). The SAB notes that the discussion and interpretation of the UST indicator provided in the technical documentation was easy-to-follow and understandable.

Furthermore, the SAB notes that the word “percentiles” might not be well understood by non-specialized users, who might interpret “percentiles” as “percent.” To facilitate understanding as for what a percentile is communicating, the SAB suggests the EPA consider this issue and use the word “rank” rather than the word “percentile” in EJScreen.

The SAB recommends that the interpretation and discussion of percentiles be provided not only in the technical documentation of EJScreen, but also in the webpage for EJScreen as well as in other locations. The SAB stresses the importance of redundancy and consistency with respect to the information provided, to ensure that users (regardless of the audience) can easily access and interpret the information in front of them.

To enhance clarity and more transparency about how percentiles are calculated within EJScreen, the SAB recommends that the EPA provide more details regarding the calculation and derivation of percentiles in the technical documentation, particularly with respect to how zero values are handled. In comparing the use of percentiles in EJScreen to two other mapping tools, namely, CalEnviroScreen and an environmental justice mapping tool used in the state of Connecticut, the SAB notes a lack of clarity as for how EJScreen handles instances where the raw, underlying variable is equal to 0 when it comes to

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1 deriving percentiles. The SAB finds that the environmental justice tool CalEnviroScreen does not allow
2 comparisons of census tracts where the value of the underlying environmental or demographic variable
3 at the tract is equal to 0. In CalEnviroScreen, the comparison among locations is only possible for those
4 locations where “a hazard effect or a population characteristic is present.”

- 5
6 • **Provide better visual representation of the percentiles by using a more appropriate color scheme**
7 **and relaying additional, useful information.**

8
9 In EJScreen, percentiles for indexes and indicators can be calculated and displayed with respect to two
10 different levels of spatial resolution. Specifically, the percentile of a block group can be shown with
11 respect to the distribution of a selected index or indicator across the entire U.S. or it can be given with
12 respect to the distribution of the selected index or indicator across census block groups within a U.S.
13 state. Given that there are two possible comparison groups, for greater clarity and ease of
14 interpretability, the SAB suggests that the EPA revises EJScreen so that the “comparison group
15 considered” is explicitly acknowledged. There are different ways in which information on the
16 comparison group can be relayed. In one case, EJScreen can display a map showing all the census block
17 groups within the comparison group with values of the percentile for each block group in the map shown
18 using colors. Alternatively, EJScreen could simply report the total number of block groups that are part
19 of the comparison group.

20
21 The SAB also proposes additional considerations regarding the visual display of the map and the color
22 scheme used. Currently, for each index or indicator, EJScreen presents maps for the percentiles where
23 only percentiles above the 80th are shown in color (in either yellow, orange, or red); census block groups
24 that correspond to percentiles below the 80th are displayed in grey color.

25
26 The SAB encourages the EPA to consider using a continuous color scale to represent the entire range of
27 values for a percentile in a continuous fashion. This would address the potential problem of
28 unintentionally over-alerting users. The SAB notes that colors such as orange or red that EJScreen
29 currently uses to indicate percentiles above the 90th and the 95th percentile, respectively, carry along an
30 implicit message of alert. While percentiles over the 90th are definitely high percentiles, depending on
31 the range and the distribution of the underlying variable, 90th and/or 95th percentiles might not
32 necessarily indicate values for an environmental or a social or demographic variable that are unhealthy,
33 risky, or of potential environmental justice concern.

34
35 Still on the issue of color scheme used to depict percentiles on a map, the SAB suggests that the EPA
36 considers the example shown in JusticeMap (<https://www.justicemap.org/>) where two different variables
37 are displayed at the same time, with the two variables grouped into a finite number of categories, each of
38 which is represented with different, gradually increasing hues.

39
40 The SAB recommends that the EPA considers using a different color palette to indicate different types
41 of indexes and indicators within EJScreen. For example, EJScreen could use the same type of color
42 palette for all the demographic indexes and indicators, while it could adopt a different color palette to
43 represent environmental indexes and indicator variables, and so forth. The EPA should also consider
44 color blindness-friendly palettes for users when updating the currently adopted color palettes.

45
46 Finally, while the unitless nature of percentiles is what enables the comparison between different census
47 block groups, the SAB notes that high-level percentiles might raise unnecessary alarms, particularly if
48 the raw values of the underlying indicators are low and well below health risk thresholds. To alleviate

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this problem and provide a more complete picture, the SAB suggests that in addition to a display of the percentiles for the index or indicator on a map, EJScreen should also present information on the raw values of the underlying environmental, demographic, and social indicators.

Tier 3 (Long-term):

- ***Incorporate or account for the inherent uncertainty in the raw data when deriving percentiles for EJScreen indexes and indicators.***

Derivation of indices and indicators in EJScreen involves the use of data on environmental, demographic, and social variables. In the majority of cases, the raw data used in EJScreen refer to estimates instead of actual observed data. Specifically, in the case of environmental indicators, the data often refer to estimates of an environmental variable obtained via a statistical model that combines data from multiple sources (e.g., monitoring sites and the output of a numerical, deterministic models). Being estimates derived from a statistical model, these estimates are also accompanied by measures – such as standard errors - that quantify the uncertainty in the estimates. In the case of socio-demographic variables, the data are typically obtained from the U.S. Census Bureau and consist of estimates obtained from the decennial Census or the ACS. These estimates are surrounded by uncertainty, which are quantified through the margin of error (MOE). The SAB remarks that the magnitude of the MOE is typically considerable for estimates obtained at the census block groups, and that this issue increases in rural areas with lower population counts. For example, if one considers the percentage of the population in a block group with limited English speaking, and one compares two census block groups the difference between the two block groups with respect to this percentage might not be equal to zero but might be smaller than the corresponding MOE's, thus indicating no significant difference between the two block groups with respect to the percentage of the population with limited English speaking. This suggests that the percentiles for the two block groups should be the same and not different as one would conclude if only the values of the percentages of the population with limited English speaking in each block group is considered and the MOE was not taken into account.

Currently, derivation of EJScreen indexes and indicators does not acknowledge nor account for the uncertainty in the raw data. The SAB strongly suggests that the EPA develop an approach that allows incorporation of uncertainty in the raw data and communicates the uncertainty in the percentile values themselves, stemming from the uncertainty in the data. The SAB suggests that the Agency considers adding 95th confidence intervals to the percentiles, following examples of other national public health and environmental health data products that have been used in the past (such as National Health and Nutrition Examination Survey (NHANES),

https://www.cdc.gov/exposurereport/estimate_percentiles.html).

- ***Develop a more appropriate approach than the current definition of percentile used for EJScreen Supplemental indexes or indicators that involve multiple demographic variables.***

EJScreen also provides percentiles for the Supplemental indexes that involve multiple demographic variables. The SAB notes that the derivation of the percentile for the Supplemental indexes is unusual, given that the demographic variables are first averaged and then the average of the demographic variables is used to multiply the percentile for the environmental indicator.

This approach to derive the percentile for Supplemental indexes appears to weigh the environmental, demographic, and social indicators differently, with the difference in weighting being driven mostly by

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1 differences in the range of values that some demographic variables can attain compared to others. At the
2 same time, while the interpretation of percentiles for individual indexes and indicators can be justified as
3 representing the probability that an average individual, living in a random census block group within the
4 U.S. or within a given state is experiencing a level of an environmental, social, or demographic variable
5 as high as the level observed in a specified census block group, such interpretation is not valid for the
6 Supplemental indexes' percentiles. From a statistical point of view, it is hard to justify the approach
7 undertaken by the EPA to derive the Supplemental indexes percentiles. Thus, the SAB recommends that
8 the EPA develop a framework to calculate percentiles for Supplemental indexes that is more coherent
9 and consistent with the approach used for individual EJScreen indexes and indicators.

- 10
11 • **Consider a finer spatial resolution or a more well-specified comparison group when calculating**
12 **percentiles for EJScreen indexes and indicators.**

13
14 The SAB highlights that while EJScreen provides the flexibility to calculate percentiles at both the U.S.
15 and an individual state level, such large-scale spatial domains might not be particularly relevant for local
16 communities that might be considered of potential environmental justice concern. The SAB finds that
17 large spatial domains do not allow to differentiate between urban and rural communities. To address
18 these issues, the SAB urges EPA to consider smaller spatial resolutions for the calculations of the
19 percentiles (e.g., county level).

20 The SAB recognizes that, while deriving percentiles of EJScreen indexes and indicators at county level
21 could allow to highlight and screen census block groups within rural areas as having elevated
22 percentiles, there is a potential that this might not happen simply because the range of the raw data in
23 rural communities is significantly different (and lower) than that of urban communities, and a county
24 might include a mix of urban and rural block groups. The SAB suggests as potential solution to address
25 this issue to perform the derivation of percentiles among only urban or only rural block groups. It is also
26 possible that the inclusion of indexes and indicators within EJScreen that are important from an
27 environmental justice perspective and are more relevant for rural communities, could address these
28 issues. There are additional concerns with respect to the fact that rural block groups might have a lower
29 opportunity of being highlighted as communities with environmental justice concerns when percentiles
30 are calculated using extensive comparison groups, as is the case when percentiles are calculated at the
31 U.S. or state level.

32 **Tier 3 (Long-term):**

- 33 • **Consider an improved approach that allows a comparison between percentiles for different**
34 **indexes and indicators of different nature simultaneously.**

35
36 The SAB notes the difference between the ranges of values and the distribution that environmental and
37 social indicators have across the U.S. This heterogeneity can in turn translate into a difficulty in
38 comparing percentiles across different EJScreen indexes and indicators. For example, the fact that a
39 census block group is above the 50th percentile for a certain EJScreen index but below the 50th percentile
40 for another one does not necessarily mean that the block group is experiencing a risky level of the
41 environmental or social/demographic variable with respect to the variable associated with the first index
42 and it is not experiencing any risk with respect to the variable associated with the second index. In fact,
43 for indicators whose raw values are generally low, the 50th percentile may erroneously highlight areas of
44 environmental justice concern. Conversely, for indicators whose raw values are generally high,
45 percentiles above the 50th might already be areas of environmental justice concern.

1
2 While there might not be an approach that allows for comparisons among percentiles relative to different
3 EJScreen indexes and indicators, the SAB invites EPA to consider devising a methodology that enables
4 comparisons among census block groups with respect to a specific index or indicator and comparisons
5 among block groups with respect to multiple indexes or indicators.

6
7 **Additional Tier 3 (Long-term) Comment:**

8
9 The SAB also notes other potential long-term considerations that may be relevant to the EPA.

10
11 The SAB also notes that the formulation presented in the technical documentation for the EJScreen
12 index for life expectancy does not allow the index to cover the entire [0, 1] range as it is the cases for
13 other indexes. To construct an indicator that spans the entire interval from 0 to 1, extremes included, the
14 SAB suggests that the indicator be revised to the following formula:

15
$$1 - (\text{Life Expectancy} - \text{min Life Expectancy}) / (\text{max Life Expectancy} - \text{min Life Expectancy}).$$

16

17 **2.2.2. Charge Question 6: EJScreen uses buffers to consider the populations surrounding a given**
18 **location. Please comment on whether the methodology for considering affected populations**
19 **using buffer analyses is logical, clearly articulated, and scientifically defensible? Do you have**
20 **suggestions on how the buffer analysis methodology could be improved?**

21
22 In examining this charge question, the SAB used a broad interpretation of the expression “buffer
23 methodology” and commented not only on the approach used to determine the value of an indicator
24 within a buffer but discussed also other aspects of the EJScreen methodology that involves buffers, as it
25 is the case in the definition of proximity-based environmental indicators.

26
27 The methodology proposed by the EPA to calculate the value of an indicator within a buffer involves
28 calculating a population weighted average of said indicator, averaged over all the census blocks that are
29 contained within the buffer. As in EJScreen indicator variables are all defined at the block group, the
30 value of an indicator in a census block is set equal to the value of the indicator in the block group that
31 contains said block. On the other hand, deriving a population weighted average requires calculating the
32 size of the population included within a buffer from a user-specified location.

33
34 The approach currently adopted in EJScreen to calculate the size of the population within a buffer is the
35 main novelty of the proposed buffer methodology. Previous approaches involved mostly areal
36 apportionment, which implicitly assume a uniform distribution of individuals across all the census
37 blocks within a block group. The SAB strongly supports the EPA’s decision to forego previous
38 approaches and focus on developing a new methodology that addresses the concerns and comments
39 raised during a previous evaluation of EJScreen.

40
41 The approach that the EPA proposes to use to determine the population size within a buffer is based on:
42 (i) the definition of internal point of a census block, available from the decennial Census; (ii) the size of
43 the population within each block and each block group, as provided by the decennial Census; and (iii)
44 the size of the population in each block group as indicated by the 5-year ACS estimates. For
45 computational ease, it is assumed that if the internal point of a census block falls within the buffer, then
46 the entire population of the block lives inside the buffer. Conversely, if the internal point of the block

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1 does not fall within the buffer, then the entire population of the block is assumed to live outside the
2 buffer.

3
4 Even though the SAB believes that the methodology proposed for the buffer analysis is logical and
5 scientifically defensible, members have expressed a few concerns and the text below reports some of
6 their recommendations, stratified depending on whether they are easily implementable or would require
7 further development and testing.

8
9 **Recommendations:**

10
11 **Tier 1 (Major):**

- 12
13 • As the SAB is supportive of the methodology proposed for buffer analyses in EJScreen, the Board
14 does not have major recommendations for this charge question.

15
16 **Tier 2 (Short-term):**

- 17
18 • **Improve the clarity of the technical documentation.**

19
20 Despite reading the technical documentation accurately, several members were unclear about how the
21 population weighted average was calculated within EJScreen, and erroneously believed that the
22 methodology adopted for the buffer analysis was still based solely on areal apportionment, as in
23 previous versions of EJScreen. The SAB strongly encourages that the EPA be more explicit in the
24 explanation of the steps involved in the calculation of the population weighted average. This can be
25 achieved, for example, by including additional text after the formula in page 37 of the technical
26 documentation. This new text could present an example that clearly illustrates the computations
27 performed within EJScreen to derive the population-weighted average of an indicator in a buffer.

28
29 The SAB also finds it unclear how the internal point of a census block is determined. For better clarity,
30 the SAB recommends that either the explicit definition of internal point of a census block is included in
31 the technical documentation or a link to the Census Bureau documentation is added to the technical
32 documentation.

33
34 **Tier 3 (Long-term):**

- 35
36 • **Address the temporal mismatch between the information from the decennial Census estimates and**
37 **the ACS 5-year estimates.**

38
39 The newly proposed methodology for buffer analyses involves the calculation of population-weighted
40 average values of indicators obtained by adding, over all census blocks contained in a buffer, the value
41 of an indicator at each of the blocks contained within a block group multiplied by a factor that should
42 represent the fraction of the population of the block group contained in the block. The multiplying factor
43 is obtained by using estimates of the population from both the decennial Census and 5-year ACS
44 estimates. Since the former provides the size of the population for each block every 10 years, and the
45 latter provides information only on the population size in a block group, averaged across 5-years, the
46 EPA proposes to account for this temporal mismatch by multiplying the most recent estimates of the
47 total population size in a block group provided by the ACS in the last five years by the fraction of the
48 total population in the block group that reside in a given block, as estimated by the decennial Census.

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While this approach is logical and defensible based on the population estimates currently available, it is also based on the implicit assumption that there are no significant changes in the distribution of the population within a block group in the course of 10 years. This assumption might not be true within urban block groups or within block groups that experience significant turn overs. There might be spatial variations across the U.S. and there might be differences between urban and rural block groups as for the validity of the implicit assumption underlying the new methodology proposed for buffer analysis. The SAB strongly encourages the EPA to assess the validity of this implicit underlying assumption.

- **Investigate the use of datasets that provide spatially resolved information on population density and population distribution for buffer analyses.**

As elaborated above, the methodology used for the buffer analysis reports involves the calculation of population weighted-average values for indicators within a buffer. These calculations use estimates of population sizes obtained from both the decennial Census, which provide population sizes for Census blocks every 10 years, and from the ACS, which provide estimates of the population with Census block groups averaged over a period of 5-years.

Besides population estimates provided by the U.S. Census Bureau, other datasets exist with information on population density and distribution. For example, Oak Ridge National Laboratory has developed fine-scale spatial resolution estimates of population density for the entire globe. These estimates are released annually and have a resolution of 1 kilometer (km) (LandScan). The SAB encourages the EPA to evaluate the appropriateness and the use of these other resources for the buffer methodology.

Recommendations about Proximity Indicators:

Besides discussing the new methodology for buffer analysis, the SAB notes some comments and recommendations regarding proximity indicators (i.e., indicators that aim to characterize the potential health risks and environmental exposure for communities that are within a certain distance from a point or a line source). Below please find recommendations regarding proximity indicators, separated into their respective tiers.

Tier 1 (Major):

- The SAB did not identify major recommendations on proximity indicators.

Tier 2 (Short-term):

- **Provide more scientific justification for the decisions used in deriving proximity indicators.**

In deriving proximity-based environmental indicators, several decisions have been made by the EPA. The Agency has determined which environmental exposures and hazards to consider for the proximity indicators and identified which distances are appropriate for each point and line source. Not much scientific justification for the use of certain distance thresholds is provided in the technical documentation. The SAB recommends that the Agency improves the clarity of the documentation by:

- **Providing scientific references as for why certain pollution sources are considered and others are not.** For example, the SAB suggests that liquefied fossil natural gas (or LNG) export facilities are added to the list of point sources considered. LNG export facilities store hundreds of

1 thousands of gallons of supercooled, frozen methane. Although these facilities should normally
2 be required to produce Risk Management Plans, due to a loophole, they are exempted from
3 producing such plans, despite storing large quantities of explosive and dangerous chemicals.
4

- 5 ○ Providing scientific justifications are for why certain thresholds are used for distances to
6 different point and line sources and explain how distances are calculated.
7

8 The SAB notes that limited scientific justification is provided for the distance thresholds applied in
9 deriving the proximity indicators. For example, it is unclear why 5 km was chosen as a threshold for the
10 distance from National Priority List (NPL) sites, Risk Management Program (RMP) facilities, and
11 hazardous waste facilities. The SAB invites the EPA to provide more robust, scientific justifications
12 regarding the use of such thresholds. The SAB also recommends the EPA to better explain how
13 distances to RMPs, Superfund sites, and hazardous waste facilities are calculated. The SAB also seeks
14 clarification regarding: (i) the derivation of the centroids for the facilities, and (ii) whether the centroids
15 of polygons enclosing the facilities are used to measure the “distance-to” measure. The SAB
16 recommends that if for RMPs, the centroids of the facilities are used to calculate distances, then a
17 modeled diameter or buffer around the facility premises should be utilized instead, so that proximity
18 indicators reflect the distance to the fence lines of a facility, as opposed to distance to the centroid of a
19 facility.
20

21 **Tier 3 (Long-term):**

- 22
23 • Consider other (quantitative) aspects of a population’s environmental exposure besides distance
24 when deriving proximity indicators.
25

26 The SAB has commented on the fact that distance is not the only factor that matters when trying to
27 represent a population’s exposure to environmental hazards, pollution, or health risks. For example, for
28 RMPs, Superfund sites, and hazardous waste facilities, the length of time that a facility has been at that
29 same location producing pollution should also be factored in. The “weight” of the facility should be
30 greater if the facility has been at its location longer to capture a more intense effect of legacy pollution.
31 Given the variety in facilities’ size, the size of the facility should also be considered and used when
32 assigning a “weight” to a facility.
33

34 Directionality should also be taken into consideration when EJScreen is used. While for a screen-level
35 tool, creating isotropic buffers without any directional biases is acceptable, for downwind or
36 downstream analysis, directionality should be considered since it affects substantially the level of
37 exposure experienced by populations in a community. Examples are provided by wind direction
38 affecting population’s exposure to air pollution, and groundwater flow for exposure due to the presence
39 of hazardous sites and underground storage tanks.
40

41 The size of the facility is also another aspect to consider and might affect the calculation of the distance
42 from the pollution source. The technical documentation discusses the fact that when dealing with large
43 facilities or sites, representing the pollution source with a point may not be adequate. If a polygon of a
44 facility is not available, then a shape representing the area of the site must be substituted and used, as
45 opposed to a centroid of a facility. For this type of situation, the SAB suggests using remote sensing data
46 (e.g., aerial photography) to calculate the distance of communities from the source of pollution more
47 accurately.
48

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- **Enable users to add other data (in various formats) or apply different distance thresholds to enrich the list of environmental exposure or environmental hazards considered.**

To provide more flexibility to users in defining aspects of environmental exposure and hazards that might be relevant to given local communities, the SAB suggests that the EPA increases the flexibility of EJScreen allowing local communities to tailor the tool to their needs. Specifically, the SAB suggests that users are given the possibility to determine their own distance thresholds when defining environmental proximity-based indicators. EJScreen could provide a few options for distance thresholds using both imperial and metric distance thresholds.

In the same spirit, the SAB also proposes that EJScreen allows users to upload additional data in multiple formats (not only in the form of shapefiles, but also in the form of Excel or CSV spreadsheet). This would enable local communities to capture other environmental hazards that are more pronounced locally and are more representative of the environmental burden experienced by the local populations. To differentiate between the user-inputted data and the data that is available within EJScreen, it is recommended that different symbology be used when displaying the two types of data. Finally, the SAB suggests that the EPA considers enriching the list of environmental exposures and environmental hazards accounted for within EJScreen to provide a better representation of the cumulative environmental burden experienced by local communities. To this end, the SAB suggests that the EPA investigates the possibility to include information on railroads and treat them as line sources of environmental pollution in the same way EJScreen incorporates and accounts for road traffic. The SAB suggests that the EPA explore and incorporate these data sources, as well as gas pipeline data, when the data are ready with sufficient quality control. Other related comments on this issue are included in the responses to charge questions for Topic Category 5.

Additional Considerations:

The SAB also notes other potential considerations that may be relevant to the EPA.

- **Consider other qualitative aspects of a population's exposure when deriving proximity indicators or when performing buffer analyses.**

It was remarked that the effect of environmental exposure from a point or a line source has a different impact depending on the type of boundary that surrounds the pollution source. For example, there is variability in the local environment around freeways: some segments of freeway are surrounded by a buffer of vegetation, thus reducing the impact of air pollution and noise in surrounding areas; others have a wall, again to limit the impact of pollution on the local populations, while others do not have any barrier around it. Some freeways have been converted into tunnels in some areas, while in some cities, freeways have been covered by platform parks. The SAB suggests that features of the built environment surrounding point and line sources of environmental hazards and pollution be considered when deriving proximity indicators or when performing a buffer analysis.

The SAB also commented on the importance and necessity to take into consideration also other aspects of exposure – not only environmental – when performing a buffer analysis. Focusing on the example of communities that have been bisected and fragmented by the highway system in the 1960s, the SAB reflected on the impact freeways had on the quality of life experienced by the affected communities. Businesses suffered as they were suddenly located next to a freeway or an underpass, and people no longer traveled through streets. The economic impact was not the only aspect that potentially took a toll

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1 on the health of these communities. Also, the isolation and worsening of quality of life for these
2 communities contributed and affected their health status. Because of these considerations, the SAB
3 invites the EPA to develop an approach that allows to incorporate also these more qualitative aspects
4 linked to the built environment surrounding a community, when developing proximity indicators and
5 carrying forward buffer analyses.
6

7 **2.2.3. Charge Question 7: Please comment on whether the [EJScreen website](#) and [technical](#)
8 [documentation](#) are clear, accurate, and transparent? Do you have any specific suggestions on
9 how to improve EJScreen documentation?**

10
11 The SAB commends the Agency for the amount of work devoted to developing the EJScreen website,
12 which presents itself as a comprehensive resource with an impressive amount of information. However,
13 the SAB remarks that while the website offers a great deal of information the modality in which it is
14 presented and displayed could be overwhelming to users, specifically first-time users as well as local
15 communities, the target audience for which the tool is meant for.
16

17 To improve the accessibility of the documentation, the SAB provides the following list of
18 recommendations.
19

20 **Recommendations:**

21
22 **Tier 1 (Major):**

- 23
24 • **Differentiate between technical documentation and a user guide for a less technical audience.**
25

26 Despite the fact that the technical documentation is already filled with a great deal of useful information,
27 the SAB feels that more scientific justification and details are needed for technical audiences. As this
28 recommendation about additional information might be cumbersome and not of interest to a less
29 technical audience, the SAB suggests that two types of documentation be developed:
30

31 (i) A technical document that dives into the details of the calculations performed within EJScreen and
32 provides references and scientific justifications for the approaches and the choices that the EPA has
33 made in deriving indicators, conducting buffer analyses, why certain approaches were not entertained,
34 etc.; and
35

36 (ii) A user guide that is tailored to a less technical audience which helps a user navigate the tool. The
37 user guide could contain links to tutorial videos that addresses questions such as “How do I ..?”, include
38 a list of frequently asked questions, and have a “Fact sheet/At glance summary sheet” that could make
39 the tool more easily approachable by community users and associations that work with community
40 users.
41

42 One of the tutorial videos addressing “How do I..?” could show how a user can add shapefiles or any
43 other data format (e.g., Excel spreadsheet, a file with street addresses, etc.) to the tool. For the
44 shapefiles, the video could discuss what system of projections EJScreen uses, what needs to be included
45 in the additional data source, etc. In developing the user guide, the SAB strongly urges the EPA to think
46 of developing material that is more visual and includes more graphics to be able to engage with a wider
47 audience that learns in different ways and not simply by reading.

1
2 **Tier 2 (Short-term):**
3

4 • **Increase transparency with respect to the data used within EJScreen.**
5

6 To increase the transparency with respect to the data used in EJScreen, the SAB recommends that the
7 Agency should:

- 8
9 ○ Create a table with acronyms that are used throughout the documentation and the user guide.
10
11 ○ Create a table with a list of all the data used in EJScreen to derive the different indexes and
12 indicators. The Table should provide information on the data source, the spatial and temporal
13 resolution of the data, indicate whether the data refers to observations/actual measurements or is
14 the result of a statistical/computer model. Additionally, the list should provide the most recent
15 date the raw data has been retrieved and uploaded in EJScreen. Finally, if the raw data refers to
16 estimates or it is the output of a statistical or computer model and is characterized by uncertainty,
17 the table should indicate whether measures of the uncertainty in the data are available.
18
19 ○ Create a table providing summary and descriptive statistics for each variable that is used to
20 derive the indexes and indicators generated within EJScreen.
21
22 ○ Include information on the EPA website regarding the ‘Office Hours’ hosted for users of
23 EJScreen, including the potential list of topics to be discussed during that time period.
24
25 ○ Include a table that lists all the distance thresholds specified with EJScreen and employed for the
26 different proximity indicators in the technical documentation.
27

28 Finally, both the technical documentation and the user guide should be developed so that they can
29 contain enough standalone information, thus still providing the necessary information a user would need
30 in case the links to the EPA website and/or other data websites that are not working.
31

32 • **Add a high-level description of each data source and justification cited in EJScreen**
33 **documentation and avoid depending solely on links that may become invalid over time.** Other
34 comments related to this data justification issue (or lack of) are included throughout this report.
35

36 • **Consider redundancy with respect to access to information.**
37

38 The SAB recommends that the EPA increases the accessibility of the tool with respect to where a user
39 could access information. The technical documentation and users guide should be available on the
40 website and for download, as well as could also be presented in pop-up windows as a user navigates
41 through the tool.
42

43 **Tier 3 (Long term):**
44

45 To ensure that EJScreen can be used effectively and benefit local communities, the SAB recommends
46 the following:
47

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- 1 • **Develop tutorial video centered around specific case studies that are of relevance to local**
2 **communities.**

3
4 In determining what case studies to consider, the SAB suggests that particular care is used and that case
5 studies be vetted carefully.

- 6
7 • **Conduct formal user testing involving the user interface team.**

8
9 To guarantee that the user guide and video tutorial are effective and helpful to users, the SAB
10 recommends that the EPA conduct formal user testing where local communities and users are invited to
11 use the tool for certain specific tasks. The experience, feedback and difficulties experienced by users in
12 working with EJScreen should be surveyed and used to update the tool. A user interface team should be
13 involved in these user testing sessions to guarantee that the tool is updated, prioritizing the users'
14 experience and improving the user interface.

- 15
16 ○ Produce videos based on recording of office hours; and,
17
18 ○ Create a walkthrough of the tool for the EJScreen app.

19
20 ***Detailed comments on the current version of the technical document (with their specific pages) are in***
21 ***Appendix A.***
22
23

1 **2.3. Topic 3: Recommendations on the Demographic and Environmental Considerations in the**
2 **EJScreen Equations** (*Charge Questions: 8, 9, and 10*)

3 NEEDS INTRODUCTION PARAGRAPH(S) TO MAJOR TOPICS DISCUSSED FOR TOPIC 3.

4 **2.3.1. Charge Question 8:** *EJScreen averages data on low-income and people of color to form the*
5 *demographic index which is used to create the EJ Indexes. The supplemental indexes use an*
6 *average of data on low-income, unemployment, less than high school education, limited*
7 *English speaking, and low life expectancy to form the supplemental demographic index.*
8 *Please comment on whether the demographic inputs used in the EJ and supplemental index*
9 *calculations reflect the peer-reviewed literature and current understanding of the*
10 *demographics on environmental justice/vulnerable communities and if there are any*
11 *suggested additions, deletions, or other changes to how these two demographic indexes are*
12 *calculated?*

13
14 The SAB finds that the use of low-income and people of color to develop the demographic index was
15 appropriate and reflected the weight of the evidence in peer-reviewed literature, particularly evidence
16 indicating that people of color and low-income populations are differentially burdened by and exposed
17 to environmental hazards and stressors. However, further discussion is needed to ensure geographic and
18 regional variation of income and poverty is considered for communities with environmental justice
19 issues.

20
21 Regarding the supplemental demographic index, the SAB expressed concern about the name of the
22 index. The SAB suggests that the EPA change the name to “Enhanced Demographic Index” or
23 “Comprehensive Demographic Index” and encourages the EPA to explore other options. Even though
24 the SAB generally agreed about the inclusion of people of color, some members felt that Indigenous
25 populations were not accurately represented in the demographic index. It was suggested that survey data
26 from Indian Bureau Service be used to obtain more accurate data for inclusion in EJScreen.

27
28 There were a number of comments about the limited English-speaking variable, suggesting that more
29 work on this indicator may be needed. Careful consideration should go into whether an indicator of
30 “limited English speaking households” captures, and does not underestimate, race as a key
31 driver/predictor to environmental justice issues,” particularly for Black/African American groups who
32 may or may not be linguistically isolated. The SAB notes that the indicator could be a race-related
33 indicator because it conflated and captured both race/ethnicity or that “while limited English speaking”
34 indicator and race/ethnicity data are related and often highly correlated to each other, each indicator
35 represents and captures different community vulnerabilities. The SAB agrees that more work is needed
36 to improve the utility of this indicator, especially when used in the supplemental demographic index
37 where race as an indicator is excluded. For instance, the “limited English speaking indicator” may not
38 fully capture the indigenous people that have had loss of native languages due to colonization practices
39 in history or Black/African American and other groups are descendants of persons enslaved in the U.S.
40 Additional analyses should consider ways to include populations such as Indigenous or Native American
41 people.

42
43 The SAB suggests that the EPA explore the possibility of including more income-related indicators that
44 better capture the vulnerability that increases the risk of a socioeconomically disadvantaged group
45 outside of the current unemployment indicator. The SAB notes that using the current unemployment
46 indicator may be problematic because it does a poor job of capturing social vulnerability in comparison

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1 to other socioeconomic status indicators. The indicator also has the potential to dilute the effects of other
2 indicators like poverty and less than high school education. In general, there was consensus on the need
3 for new income-related indicators to be used in EJScreen. For example, the use of an employment
4 indicator that captures underemployment may better reflect the socioeconomic conditions in
5 communities experiencing environmental injustice. Another suggestion is to include the percentage of
6 household income used for paying property taxes as a new measure of economic burden. Other
7 possibilities include per capita income, median household income, and percentage of renter-occupied
8 housing units. Additionally, the EPA could use extremely low-income as an indicator to help us
9 highlight and focus on highly vulnerable groups in almost a hyperlocal way which is very important
10 because environmental justice is very local and location-based. Furthermore, single parent households
11 and the percentage of free lunches in public schools were suggested as indicators to capture the
12 economic burden of populations of concern, particularly school-age children.

13
14 As mentioned in Charge Question 2, the SAB recommends that the EPA explore the possibility of the
15 inclusion of low life expectancy, which needs more clarification and examination. Some members
16 argued that since low life expectancy is not a demographic or socioeconomic indicator, then it should
17 not be included in the main EJ Index or the supplemental index. One member suggested that its
18 inclusion in the current supplemental index may be due to the fact that it is acting as a race-
19 proxy/racism-proxy indicator or to capture cumulative health vulnerability. Others thought that if its
20 inclusion was meant to capture cumulative biological susceptibility, then other health-related indicators
21 should be added to EJScreen.

22
23 For health-related indicators, more data from CDC PLACES could be added to the Supplemental Index
24 to capture health outcomes. It would be important to add health data beyond respiratory disease and
25 cardiovascular disease outcomes. However, the SAB notes the limitations of CDC PLACES data, as the
26 smallest geographic unit of data available is at the census tract level. For other indicators, the SAB
27 suggests the EPA consider mental health data, health insurance, health care access data, Medicaid and
28 Medicaid populations, and whether an area was medically underserved or a healthcare professional
29 shortage area.

30
31 If the EPA includes health-related indicators in the EJScreen tool, then a public health index may be
32 necessary. This index should include health-related indicators including disease status (prevalence data),
33 but also data on well-being including mental health, quality of life, and the life expectancy indicator.
34 Low life expectancy indicator is a good indicator but should not be included in the Supplemental Index.
35 It should be moved to a separate index.

36
37 There was a wealth of discussion and consensus that a number of populations were missing from the
38 existing supplemental index. The SAB notes the need to include children below the age of 5 and adults
39 above the age of 65 due to their life stage as a susceptibility factor for increased risk of exposure and
40 poor health outcomes associated with living in an area with hazards or stressors. The SAB suggests that
41 the EPA uses contextualized age groups in the tool based on the region or whether it is an urban or rural
42 area. For example, individuals 20-44 years old have been disproportionately impacted by the opioid
43 epidemic in rural communities and this age group is disproportionately impacted by incarceration in
44 urban communities. Additional discussion occurred on the need to have more context-specific
45 demographic indicators in the tool that may be more representative of the populations of concern in rural
46 and remote areas compared to populations of concern in urban areas. For example, the SAB suggests
47 that the EPA include populations residing in remote and isolated areas with access to limited
48 infrastructure such as the Amish/Mennonite population in rural areas.

1
2 The SAB recommends that EPA incorporates non-census and non-ACS data into the EJScreen tool to
3 better capture socioeconomic vulnerability of groups who may be experiencing environmental injustices.
4 One reason to use other datasets is because the data from the Census generally captures exposures or
5 populations through their residential addresses but may not accurately capture the social and economic
6 vulnerability that are related to places where people spend their time during the day. The census data
7 focuses more on residential environments and does not adequately capture exposures in other
8 microenvironments like schools or workplaces. The SAB also recommends that the EPA consider these
9 microenvironments (e.g., schools or workplaces) and add kindergarten to 12 grade education (K-12) data
10 to include school environment data, as well as workplace data such as data from OSHA as additional
11 layers in the tool.

12
13 The SAB recommends that the EPA include other important vulnerable populations either in the main
14 EJ Index, Supplemental Index, or as context layers. It is also important to include migrant workers who
15 have greater exposure to pesticides and could experience greater exposure to heat and other physical
16 stressors due to their work environments. Migrant child labor is also a concern that the EPA may want to
17 explore as an indicator in the tool. The SAB recommends that the EPA also include homeless
18 populations and incarcerated individuals (including individuals currently in a prison) or formerly
19 incarcerated and back in their home communities. Additionally, as addressed in Charge Question 1,
20 based on the new Presidential Executive Order 14096 on Environmental Justice, the SAB suggests the
21 addition of an indicator to capture individuals with disabilities (i.e., physical, mobility-related, and
22 disease-related).

23
24 There was rich discussion among the members that more vulnerability-related indicators should be
25 included in the EJScreen tool, and that the EPA should explore the possibility of including the indicators
26 in the main EJ Index, Supplemental Index, or a different index. The SAB further notes the connection
27 between environmental justice and resources. In traditional environmental justice work, the science
28 community reviews data to assess differences in burden, exposure, and risk associated with
29 environmental hazards and chemical and non-chemical stressors. The SAB suggests that the science
30 community should take more of a social determinants of health approach to screening for environmental
31 justice and use relevant indicators and/or indices.

32
33 The SAB notes a number of health-promoting resources and/or infrastructure information that should be
34 included in the tool such as: 1) access to supermarkets and grocery stores; 2) access to transportation; 3)
35 access to safe and healthy housing; 4) access to parks and green space; 5) access to clean rivers and
36 streams; 6) access to ecological goods and services; 7) access to cultural wellness centers; 8) access to
37 civic organizations; 9) access to churches, mosques, temples, other faith groups; 10) access to libraries;
38 11) access to community centers, Young Men's Christian Association (YMCAs), clubs, among others;
39 and 12) access to healthcare infrastructure. One issue to recognize is access to insurance to not only
40 include access to health insurance, but access to homeowners or renter's insurance. This could be an
41 issue in communities and be costly in said communities because of climate change and the constant
42 threat of climate related perturbations such as frequent floods, hurricanes, forest fires, and tornadoes.

43
44 The SAB offers suggestions about adding more mathematical rigor to the selection of indicators that
45 should be used in the primary demographic index or supplemental index. The EPA could explore the
46 option of using Principal Component Analysis (PCA). There could be a need to perform a sensitive
47 analysis since multiple versions of EJScreen are now available. The SAB agrees that whatever indicators
48 are included or excluded, there needs to be some discussion about inclusion, exclusion, and limitations

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in appropriate documentation. The EPA should engage with impacted residents and populations of concern to help select the most appropriate demographic indicators for both nationally representative datasets and more regionally focused datasets.

The EPA should be aware of long-term consistency of metrics and duplicative efforts. This level of awareness will ensure that the tool has nationally consistent datasets. To improve the quality and rigor of demographic indicators used in the tool, the EPA could use data available from other federal agencies. Although the EPA could consider including social vulnerability-related indicators, it should be noted that the CDC already has a Social Vulnerability Index (SVI), and it may involve duplication of efforts. However, the CDC dataset and the SVI are only available at the census tract level and not at the block group level.

Recommendations:

Tier 1 (Major):

- There are no major recommendations for this question.

Tier 2 (Short-term):

- The SAB recommends that the EPA conduct a sensitivity analysis, and/or leverage a previous peer review report completed on EJScreen that includes a sensitivity analysis.
- The SAB recommends that the EPA include additional rural environmental and demographic specific indicators – particularly when looking at rural communities, as discussed in the charge questions for Topic Category 5.
- The SAB recommends that the EPA include other important vulnerable populations and microenvironments either in the main EJ Index, Supplemental Index, or as context layers, including socially disadvantaged or marginalized groups that are not included in U.S. Census or ACS residential data.
 - The SAB recommends that the EPA include immigrants, Indigenous people, and single-parent households as context layers in the Supplemental Index.
 - The SAB also recommends that the EPA add kindergarten to 12 grade education (K-12) data to include school environment data, as well as workplace data such as data from OSHA as additional layers in the tool.
- The EPA should align with the Executive Order 14096’s new environmental justice definition. Specifically, the SAB recommends that the EPA include persons with disabilities as a demographic indicator for environmental justice communities.

Tier 3 (Long-term):

- The SAB recommends that the EPA consider the best way to incorporate homeless individuals, incarcerated residents, and Amish/ Mennonite communities in the Demographic Index, Supplemental Index, or supplemental layers based on the representativeness of the data, availability of data, etc.

- The SAB recommends that the tool allow users to define what demographic index is included as a layer.
- The SAB recommends that the EPA develop more regionally specific demographic indices that are based, for example, on EPA regions or National Climate Assessment regions. The EPA should also engage impacted communities to help select appropriate demographic indicators and develop these and supplemental indices.

2.3.2. **Charge Question 9: Please comment on whether the use of an average of the demographic factors in the demographic and supplemental demographic indexes is appropriate and scientifically defensible. Details on the calculations can be found in the EJScreen technical documentation. Do you have recommendations on how these calculations could be revised to better address the targeted communities?**

There is moderate consensus that the use of an average of the demographic factors in the demographic and supplemental demographic indexes is appropriate and scientifically defensible. The average is a measure that is commonly used in statistics by helping to normalize data across different units and ranges. The average has been used in screening tools like EJScreen because it is one of the simplest, most transparent, and easiest measures for the general public to understand and follow. In communicating information about the ranking of communities, it increases the ease of use, understandability, and inclusivity that is helpful for populations and communities of concern that are experiencing environmental justice issues. Since EJScreen is a screening tool, the ability to rank and compare communities is an important aspect of making sure that the tool is responsive to the needs of those populations and communities that are experiencing environmental injustices.

The SAB recommends that the EPA ensures that its use gives an accurate evaluation, description, and reflection of the phenomena and/or relationships that the average is trying to represent. The SAB requests that the EPA provide more details on the assumptions that underlie its application of average for the main demographic index and supplemental demographic indexes. Based on the EJScreen technical documentation, the focus of the Demographic Index on people of color and low-income population is justified by [Executive Order 12898](#) – *Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations*. The wording used in Executive Order 12898 seems to be suggesting that particular attention ought to be focused on people of color AND low-income population with respect to environmental justice. However, it is not clear in the technical documentation if the Executive Order was really an “AND” versus an “OR”. In probability and statistics, “AND” and “OR” do not mean the same thing. With the “OR” we are thinking of the greater set, the union of the group of individuals who are people of color and those who are low-income, whereas “AND” just focuses on the intersectionality. Assuming that the Executive Order 12898 wanted to focus on the “OR” rather than the “AND”, there is an implicit mathematical assumption that the use of the demographic index as the fraction of the proportion of people of color and the proportion of people of low-income. To determine whether the demographic index is appropriate and justifiable is important to understand whether those implicit mathematical assumptions hold across the U.S. Note that the same implicit mathematical assumptions would hold if the Executive Order 12898 was referring to an “AND” rather than an “OR”. In addition, there is an assumption of independence between the demographic indicators (i.e., people of color, low-income, etc.) and environmental exposures. For example, if the assumption is that at least 50% of the people of color were low-income and at least 50% of the low-income persons were people of color across the entire country does not hold true, then the use of the average for the

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1 main demographic index and supplemental demographic indexes for the entire country may be
2 problematic. We could see variation at the subnational level including at the regional and state levels,
3 which would dictate the need to use measures that were more sophisticated, representative, and accurate
4 than the average. However, since we cannot change how Census data is collected, the calculation was
5 seen to be appropriate because the primary goal of the tool is to rank communities and not rank
6 percentages. Thus, we can assume that the communities who score higher on a particular index or set of
7 indices also have higher raw values. This means that the use of the average calculation is justified, and
8 we do not need to worry about raw percentages.

9
10 Additionally, the members discussed the need to understand that the 50% percent threshold for both
11 people of color and low-income persons does not capture all individuals who experience environmental
12 injustice. As numerous studies have shown, race is the single most important predictor of the
13 distribution of environmental hazards in the U.S. Many people of color, particularly African Americans
14 who live in middle- and high-income neighborhoods have been shown to experience environmental
15 injustices. These areas (census tracts or block groups) should still be classified as areas with
16 environmental justice issues. Due to the history of racism, disinvestment and divestment, barriers to
17 wealth accumulation (generational wealth) and economic capital, differential access to infrastructure and
18 services, redlining, segregation, and limited political voice, many middle- and higher-income people of
19 color neighborhoods experience environmental injustice similar to their lower-income counterparts. We
20 also observe whiter, low-income communities who experience disproportionate burden of environmental
21 hazards and stressors, should this be categorized as environmental injustice or just injustice? The SAB
22 also discussed the need to remove Indigenous people from the people of color indicator. There needs to
23 be specific accounting of Indigenous people and separating them from percent non-White is an
24 important first step. The SAB recommends that the EPA explore creating a separate average for
25 Indigenous and/or Native American or Indigenous populations.

26
27 To address the concerns about the accuracy of using the average in the main EJ Index and supplemental
28 indices, the SAB recommends that the EPA performs sensitivity analyses. The SAB expressed concerns
29 that the integration of people of color and low-income in the main demographic index or the integration
30 of the five demographic indicators in the supplemental demographic index can lead to dilution or
31 masking at the census block group level. Sensitivity analyses would be useful for addressing accuracy of
32 the measure at the national level and variation when using different combinations of demographic
33 indicators.

34
35 The SAB recommends that the EPA do a better job on science communication related to explaining how
36 to use the tool and what the average means in the context of the main demographic index and
37 supplemental indexes. Through community engagement and integrated educational programming, the
38 EPA can use the EJScreen interface to increase the spatial and scientific literacy of user populations,
39 particularly those users who live in communities facing environmental justice issues. Through enhanced
40 community engagement, the EPA could create a feedback loop to obtain information from users on how
41 to improve the ease of use, navigability, and utility of EJScreen while also seeking information to
42 improve the scientific and mathematical rigor of EJScreen. The average can be used as an initial starting
43 point but through bidirectional communication with user populations, additional more robust and
44 advanced measures could be added to the tool. This approach would also allow the EPA to add
45 important demographic factors like race in the supplemental demographic indexes. Due to the wealth of
46 scientific research on the role of race as the primary factor driving environmental injustices, it is
47 recommended that the EPA include race as a demographic indicator in all relevant indices. Furthermore,

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1 the SAB recommends that the documentation and functionality of the tool is improved so it can be used
2 by everyone similar to what we see with Turbotax.

3
4 EJScreen should continue to be a tool that many different user groups could use, particularly individuals
5 who are experiencing environmental injustice. The tool should include clickable links that allows the
6 users to go more in-depth and includes the ability to navigate beyond the national level, and to explore
7 more complex relationships. The tool should have flexibility in allowing users to add or remove specific
8 demographic indicators in the Supplemental Index, as well as more detailed documentation on how
9 calculations were performed, and which variables were included. Additionally, the tool should have a
10 help desk for users to ask questions and get assistance on using the tool regardless of their level of
11 knowledge in environmental justice or familiarity with using screening tools like EJScreen.

12 **Recommendations:**

13 **Tier 1 (Major):**

- 14
- 15
- 16
- 17 • There are no major recommendations for this question.
- 18

19 **Tier 2 (Short-term):**

- 20
- 21 • The use of an average of the demographic factors is appropriate and scientifically defensible.
22 However, the SAB notes that by averaging indicators that can be of different ranges, there is the
23 potential to mask the variability in the smaller indicators. Therefore, the SAB recommends that the
24 EPA conduct additional sensitivity analysis to factor this potential issue.
- 25
- 26 • The SAB recommends that the EPA focus on Native American and Indigenous people more
27 specifically within the tool (also as noted in the recommendations for Charge Question 8).
- 28
- 29 • The SAB recommends that the EPA provide clarity on the assumptions and limitations behind each
30 indicator.
- 31
- 32 • The SAB recommends that the EPA provide clarity on what using the average means for the national
33 comparison.

34 **Tier 3 (Long-term):**

- 35
- 36 • The SAB recommends that the EPA include spatial statistical approaches that allow hotspots to be
37 identified where significantly higher values of socio-demographic and environmental indicators
38 converge.
- 39
- 40 • If the EPA brings in additional measures, the SAB recommends that work needs to be done on the
41 communication to increase literacy in the use of the tool and feedback from the community of users.
- 42

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2.3.3. **Charge Question 10:** *Please identify other currently available, nationally consistent, environmental datasets that are germane to the issues impacting EJ communities but not yet included in EJScreen. Please provide input on the efficacy of the current indicators in terms of highlighting issues relevant to EJ communities; as well as feedback on criteria to ensure future indicators meet this goal and are not duplicative of other existing datasets.*

The SAB recommends that the EPA needs to include other available, nationally consistent datasets relevant to issues impacting communities with environmental justice issues but not yet included in EJScreen. Since many of the current indicators capture the presence of a hazard or stressor that may disproportionately burden certain racial/ethnic groups, socioeconomic groups, and geographies (rural vs urban) that the SAB finds that it is important for the nationally consistent data to be collected in a standardized, uniform, unified way. Data quality is fundamental; it is important that all data included in the tool has been validated. There should be robust documentation explaining how the data was collected and better documentation and justification of all datasets and indicators than for the current tool. There must be engagement of various stakeholders in the development of criteria needed to include additional environmental data/indicators/variables into EJScreen. The SAB suggests that the EPA prioritize justifying the purpose of each dataset/indicator/variable and ensure that there is no duplication (added a new variable/indicator that is not similar to one already in use). Data agreements should also be in place to understand who owns the data because some of the most relevant nationally consistent datasets are not federally owned but privately owned, and the EPA must add datasets that are durable and have longevity.

As general consensus, the SAB finds that the clarity of the datasets used for the tool would be improved if the EPA clarify the definition of “nationally consistent datasets” as the criteria used for indicators in EJScreen. However, having only nationally available and consistent datasets could be problematic since environmental justice or injustice is placed-based, neighborhood-level, and hyperlocal. Many communities impacted by environmental injustice and related health issues want to see a tool that captures their experiences with being overburdened by hazards or stressors; experiences with environmental racism, classism, or political marginalization; and/or their experiences with the lack of access to health-promoting social, environmental, economic, and health infrastructure (including green spaces, parks, grocery stores, living wage jobs, high quality schools, ecologic goods and service, healthy housing, etc.).

However, there was extensive discussion about how the current set of indicators are not relevant for various parts of the country. The tool seemed to be biased towards urban areas and does not adequately capture the experience of Indigenous peoples and tribal communities. Additionally, the tool does not include indicators/variables/dataset that reflect the disproportionate impacts of the fossil fuel industry and related industries on rural communities. Some members suggested that we needed to be flexible in how we defined nationally consistent datasets. In some cases, instead of using census tract or block group level data, county level data may be more appropriate. Members discussed the need to use units of analysis that were more appropriate for the geographic area such as census block groups may be useful for urban areas, but other units of analysis may be more appropriate for rural areas.

When trying to compare with the national average, having nationally consistent datasets was important, but having too many indicators could lead to some indicators masking more important ones or diluting the effects. The SAB agrees that criteria need to be developed on the type of indicators that would be included, data quality, data reproducibility, and data utility. There is a need to develop criteria on how the data would be used (i.e., would the particular indicator be included in the main EJ Index,

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1 Supplemental EJ Index, or as a layer that could be added to demonstrate a particular distribution or
2 visualize an environmental phenomena). The SAB cautions the EPA on how many of these new
3 indicators should be included in the main EJ Index. The EPA should describe how a particular indicator
4 like oil and gas wells or confined animal feeding operations (CAFOs) would only be represented as a
5 count variable (e.g., number of wells or operations) for each block group and may not lend themselves
6 well to a nationally consistent dataset. Other members thought that by using the API [NEED
7 DESCRIPTION] for oil and gas wells, a nationally consistent dataset could be developed.
8

9 The SAB finds that adding indicators that would not negatively impact the integrity of the percentile
10 ranking or scoring methodology (if a scoring methodology is developed in the near future). Additional
11 indicators would be beneficial for demonstrating areas with high vulnerability, burden, or risk. For
12 example, the idea of adding some socioeconomic indicators that captured very low-income populations
13 such as extremely low-income would be better suited as a map layer and not to be included in the EJ
14 Index. The use of this indicator will allow decision-makers to micro-target areas where these
15 populations are, populations that may be severely limited in their access to infrastructure, economic
16 opportunity, care, insurance, social services, and political power. For example, environmental conditions
17 in the arid parts of the U.S. Southwest and where people live in the borderlands are not adequately
18 captured in this tool. The SAB seeks clarification about how the EPA address regions of the country
19 where the tool misses the underlying environmental or socioeconomic factors that contribute to
20 environmental injustices for these populations.
21

22 The SAB is interested in the EJScreen evolving into a national platform where users, including impacted
23 populations, could access multiple tools, indices, indicators, and datasets. The SAB recognizes that there
24 are some major limitations with EJScreen’s ability to capture environmental injustice for all
25 overburdened and underserved groups at a more local level. There is a potential that the one size fits all
26 approach could be inappropriate. The SAB notes for future development, having multiple EJScreen tools
27 including national level, regional level, and state-level tools could be beneficial for environmental
28 justice communities. There are many state-level screening tools that work better than EJScreen because
29 they have context-specific, spatially relevant indicators. Screening tools like CalEnviroScreen and others
30 have many datasets including pesticides and CAFOs that are not currently available in EJScreen. The
31 SAB suggests that the EPA should work on developing multiple screening tools (e.g., a national
32 screening tool as well as regional tools), with the long-term goal of a EJScreen tool for every region
33 since many states do not have their own EJScreen tool. For example, the tool Maryland-EJScreen is
34 currently available and there are discussions about developing a regional EJScreen tool for EPA Region
35 III. The SAB finds that having tools that are flexible with multifunctionality is important. The SAB
36 highlights the need for the EPA team to focus on scalability, interoperability, resolution, and scale which
37 would allow EJScreen to provide comparisons nationally but also allow users to zoom in to see what is
38 happening at a more granular scale. Several members noted that fit for purpose in the use and
39 application of the tool is important. This “fit for purpose” construct should help drive what
40 environmental indicators are added to the tool, and how and when the specific indicators are used. The
41 SAB also suggests that the EPA work through its interagency collaborations and partnerships to bring
42 more relevant health data into the tool from Health and Human Services particularly the CDC and
43 additional data from other agencies including USDA, Federal Emergency Management Agency
44 (FEMA), National Oceanic and Atmospheric Administration (NOAA), Department of Energy (DOE),
45 and the USGS.
46

47 Attached below is a list of data/variables/indicators mentioned during the discussion:

- 48 • Pesticides

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- 1 • Climate-related indicators
- 2 ○ Heat including extreme heat
- 3 ○ Hurricanes
- 4 • Health
- 5 ○ Cancer
- 6 ○ Prevalence data (need clarification)
- 7 ○ Health Disparities
- 8 ○ Mental Health
- 9 ○ Quality of Life Indicators
- 10 ○ Individuals with disabilities
- 11 • Salutogenic and Resiliency-related Indicators
- 12 ○ Housing Infrastructure
- 13 ○ Food Infrastructure
- 14 ○ Transportation Infrastructure
- 15 • Rural-Focused Indicators
- 16 • Energy-Related Indicators
- 17 ○ Pipelines
- 18 ○ Power Plants
- 19 ○ Oil and gas wells
- 20 ○ Fracking sites
- 21 • Water-related Indicators
- 22 ○ Water quantity
- 23 ○ Water quality
- 24 ○ Wetlands
- 25 ○ Groundwater contamination
- 26 ○ Drinking water wells
- 27 ○ Reclaimed water use
- 28 • Noise
- 29 • Methane
- 30 • CAFOs
- 31 ○ Type of animals
- 32 ○ Weight of animals
- 33 ○ Number of animals
- 34 ○ Amount of waste
- 35 ○ Size of the operation
- 36 • Age, quality and access to Infrastructure
- 37 • Drinking water infrastructure
- 38 • Septic tanks
- 39 • Publicly regulated sewer infrastructure
- 40 • Age of housing
- 41 • Combined sewer systems and overflows
- 42 • Flooding Risk
- 43 • Impervious Surfaces
- 44 • Permit Compliance
- 45
- 46

1 **Recommendations:**
2

3 **Tier 1 (Major):**
4

- 5 • The SAB recommends that the EPA provide a well-developed rationale for the inclusion or
6 exclusion of indicators that represent the conditions that environmental justice communities
7 experience (i.e., if the indicators were or were not included in the tool, why that was the outcome).
8 For example, in the event an indicator was considered, why it was, or it was not included in the main
9 EJ Index or Supplemental Index. This step is necessary to increase the transparency and validity of
10 the tool.
- 11
- 12 • The SAB recommends that the EPA include documentation explaining how the data was collected
13 and provide better documentation and justification of all datasets and indicators for the current tool.

14 **Tier 2 (Short-term):**
15

- 16 • The SAB recommends that the EPA use census block groups and tracts that may be useful for urban
17 areas, but other units of analysis that may be more appropriate for rural areas.
- 18
- 19 • The SAB recommends that the EPA develop criteria on how the data would be used (i.e., would the
20 particular indicator be included in the main EJ Index, Supplemental EJ Index, or as a layer that could
21 be added to demonstrate a particular distribution or visualize an environmental phenomena).
- 22
- 23 • The SAB seeks clarification about how the EPA addresses regions of the country where the tool
24 misses the environmental or socioeconomic factors that contribute to environmental injustice for
25 populations of the arid parts of the U.S. Southwest and where people live in the borderlands.
- 26
- 27 • The SAB recommends that the EPA team focus on scalability, interoperability, resolution, and scale.
28 This would allow EJScreen to provide comparisons nationally but also allow users to zoom in to see
29 what is happening at a more granular scale.

30 **Tier 3 (Long-term):**
31

- 32 • The SAB recommends that the EPA include indicators that would not negatively impact the integrity
33 of the percentile ranking or scoring methodology (i.e., if a scoring methodology is developed in the
34 near future). This activity would be beneficial for demonstrating areas with high vulnerability,
35 burden, or risk.
- 36
- 37 • The SAB recommends that the EPA develop criteria on the type of indicators that would be included
38 in the tool, its data quality, data reproducibility, and data utility. These criteria should be well-
39 documented and publicly available.
- 40
- 41 • The SAB recommends that the EPA evolve EJScreen into a national platform where users, including
42 impacted populations, could access multiple tools, indices, indicators, and datasets.
- 43
- 44 • The SAB recommends that the EPA work through its inter- and intra-agency partnerships to bring
45 more relevant health data into the tool (i.e., health and Human Services particularly the CDC and
46 additional data from other agencies including USDA, FEMA, NOAA, DOE, and the USGS).

1 **2.4. Topic 4: Advice on the Incorporation of Cumulative Impacts and Scoring** (Charge questions:
2 11, 12, and 13)

3 NEEDS INTRODUCTION PARAGRAPH(S) TO MAJOR TOPICS DISCUSSED FOR TOPIC 4.

4 **2.4.1. Charge Question 11: EPA introduced the threshold maps to EJScreen in 2022 for the first**
5 **time. These allow EJScreen users to look across all twelve indexes at once, providing a**
6 **cumulative outlook on vulnerable populations facing higher pollution burdens. Please**
7 **comment on the suitability of the threshold maps for examining the cumulative environmental**
8 **and social burdens on a community.**

9
10 The threshold map is a very significant improvement to the EJScreen tool as it provides a more
11 meaningful insight into cumulative impacts (however it is defined by the EPA) than the single indicator
12 maps or summary scores. Threshold maps also address EJScreen's need to be flexible and useful to
13 many different users with different, often targeted, concerns. In particular, the ability to select and
14 combine specific EJ indexes and specify percentile ranges with upper and lower bounds facilitates data
15 exploration and analysis for tailored users' interests, allowing users to emphasize or drop out metrics as
16 their problem dictates. These features are unique to this tool, making them particularly useful. The SAB
17 finds the function to download a flat file of metrics and indexes at either a state or national level very
18 useful, as it allows to query individual block groups with the cursor and turn the selected block groups
19 layer on and off conveniently during map exploration. The SAB finds that threshold maps also allow
20 users to explore cumulative effects of multiple indicators as defined by their selection of indicators.

21
22 Given the utility and potential of the threshold maps, the SAB suggests that the tool allow users to
23 export (i.e., in addition to a flat file of metrics and indices) the block group boundary files with
24 descriptive attributes of the selected polygons, both in geodatabase and/or shapefile format, and in .kml
25 format for GoogleEarth users. The SAB believes that the EPA could improve the maps' utility when
26 comparing selected block groups to one another by symbolizing selected block group polygons with a
27 color ramp (i.e., when including the saturation associated with the degree to which the selected variables
28 exceed the minimum bound). This approach could provide a crude way to differentiate the
29 highest/lowest attainment of the thresholds.

30
31 The option to have percentiles calculated using national vs state samples is excellent, and the SAB urges
32 that the EPA expand that option to other geographic regions. Because the policy solutions for different
33 environmental justice issues vary, it would be very valuable to non-technical stakeholders and
34 communities to allow for calculation by city, county, and different administrative district levels (e.g.,
35 EPA Region, air quality management district, political districts – City Council, County Supervisory,
36 State or Federal political district etc.) Although this calculation is very simple, the SAB recognizes that
37 the challenge would be to collect the boundary files for these various geographic entities and organize
38 the choices on the dialogue interface to present them clearly and intuitively.

39
40 **Recommendations:**

41
42 **Tier 1 (Major):**

- 43
44 • The SAB considers the threshold maps to be a very significant improvement to the EJScreen tool
45 and that the threshold maps are a suitable tool for users to understand multiple exposures and
46 vulnerabilities in resident populations using the metrics available in EJScreen. The SAB

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1 recommends minor adjustments to improve their utility for users with different needs. In general,
2 this recommendation includes options to aggregate and export data using different geographic units
3 and improving symbology to display areas of increasing threshold exceedances in map view.

4 **Tier 2 (Short-term):**

- 5
- 6 • The SAB recommends that the EPA allow users to export (in addition to a flat file of metrics and
7 indices) the block group boundary files (with descriptive attributes) of the selected polygons, both in
8 geodatabase and/or shapefile format, and in .kml format for GoogleEarth users. The option to have
9 percentiles calculated using national vs state samples is useful, and we urge EPA to expand that
10 option to other geographic regions. Because the policy remedies for different environmental justice
11 issues vary, it would be very valuable to non-technical stakeholders and communities to allow for
12 calculation by city, county, and different administrative district levels. The SAB also recommends
13 that the EPA expand the option to have percentiles calculated using national vs state samples.
 - 14 • The SAB recommends that the EPA improve the maps' utility when comparing selected block
15 groups to one another by symbolizing selected block group polygons using a color ramp, with
16 saturation associated to the degree to which the selected variables exceed the minimum bound. This
17 approach would provide an intuitive way to differentiate the highest/lowest attainment of the
18 thresholds.

19 **Tier 3 (Long-term): This is a non-consensus recommendation based on one member's suggestion.**

- 20
- 21 • The SAB recommends that the EPA explore the possibility for users to add individual environmental
22 indicators from outside sources (main and supplemental) to the threshold map, perhaps through use
23 of a map service or GeoPlatform. However, the SAB cautions that this may not be feasible if it
24 places too much variation in map symbology and makes the maps difficult to read and interpret. This
25 effort would be complicated if these data are at the census tract level (such as, for example, data
26 from White House Council on Environmental Quality (CEQ) Climate and Economic Justice
27 Screening Tool or CEJST) as EJScreen values would have to be aggregated up to the same
28 geography to be comparable.

29 **2.4.2. Charge Question 12: The agency is interested in creating a cumulative score within**
30 **EJScreen. Please comment on potential appropriate uses of a cumulative score in the tool.**

31

32 The SAB Panel members are unanimous in recognizing that multiple pollutant exposures and population
33 vulnerabilities can result in cumulative burden, and understand that cumulative impacts, its effect and its
34 burden on communities are of great concern to EJScreen users. Members are also aware of the desire of
35 users to have a means of characterizing cumulative impacts using a single number, or "score" that is a
36 meaningful and fair way to compare these effects among different places, with higher/lower scores
37 indicating greater importance as such a score can have great policy relevance. Some researchers have
38 attempted to develop metrics of this type, usually by aggregating or summarizing indicator values;
39 similar efforts have been developed by some States such as California, Maryland, Michigan, Colorado,
40 New Jersey, Washington and potentially more. These efforts represent important steps toward
41 understanding and characterizing cumulative effects, and it is the responsibility of the Agency to
42 continue to develop that understanding. Methods inspired by States could be further explored at a
43 national level along with the SAB recommendations provided below.

44

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1 This charge question relates to potential uses of such a score, but because no such score is currently
2 available in EJScreen, the SAB also interprets this charge as asking the SAB to weigh in on the process
3 of developing such a score, and issues that complicate creating a score that is both useful and well-
4 supported by the scientific understanding of cumulative impacts, effects, and burden.

5
6 This task is first complicated by the absence of clear definitions of key terms, such as “cumulative
7 effects”, “cumulative impacts”, “cumulative impacts assessment”, etc. Clearly defined terms are
8 necessary to focus meaningful analysis of this task. For example, “cumulative impacts” is increasingly
9 being used by many different stakeholders in the environmental justice debate. This use is complicated
10 and potentially confusing because there is no single standard definition, and there is a tendency for
11 different stakeholders to adopt or assume their own definition. The lack of a standardized definition only
12 serves to complicate and obfuscate progress in understanding environmental justice problems and
13 solutions. To date, EJScreen has wisely avoided use of the term “cumulative impacts” or “cumulative
14 risks” in technical documentation, the Frequently Asked Questions document, and within the mapping
15 tool interface, but the Program needs to do so in a comprehensive and transparent manner prior to
16 developing such a score.

17
18 Development of a cumulative score within EJScreen is also complicated by concerns about how current
19 EJScreen indicator metrics relate to cumulative impacts, and the ability of these metrics to quantify
20 cumulative effects. The SAB members believe that EJScreen currently lacks the appropriate metrics or a
21 defined approach to quantify cumulative impacts. The current indicators reflect exposure, or potential
22 exposure, and do not include information required to determine how these values relate to actual impacts
23 or effects. The EJScreen metrics are calculated as percentile values, ranks that reflect order; it is
24 inappropriate to add or multiply these values together in the same way that can be done with
25 measurements. Several EJScreen indicators capture exposure to the same hazard (“double counting”),
26 which would impose differential weighting among hazards that is a product of how and what data is
27 collected, not their contribution to cumulative effects. Some SAB members are concerned that existing
28 methods of calculating a single cumulative score may not fully address these challenges, would not
29 realistically or fairly characterize cumulative impacts, and would carry significant potential and risk of
30 users misinterpreting its meaning.

31
32 A final issue is that EJScreen is used for different purposes by a variety of stakeholders. For example, it
33 is used by the public to better understand potential community-wide environmental concerns, and it is
34 increasingly being used by federal and state regulators to inform permitting decisions and new health-
35 based regulations. Because of EJScreen's widespread and cross-purpose applications, it is not feasible to
36 expect a single score or index to provide meaningful results in all contexts. If a score or index is
37 developed, the EPA will need to provide clear guidance on how results should be interpreted in different
38 contexts.

39
40 To further this issue, the SAB believes there may be value in organizing individual indicators into
41 groups that address a common concern (e.g., organize indicators into categories and calculating
42 “cumulative effects” for a given category). This approach could ensure that categories with more
43 indicators do not have an outsized influence over other categories with a fewer number of indicators.

44 These categories may include:

- 45 ○ Air impacts/risks
- 46 ○ Water impacts/risks
- 47 ○ Climate factors
- 48 ○ Health factors

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- Housing factors
- Green space/ecological services

Categorical indices may better support targeted decision making, and the ability to conduct a targeted fit-for-purpose assessment.

To advance the science to cumulative impacts and burdens as a critical framework in environmental justice, the SAB recommends a series of dedicated workshops, panel discussions, and additional dialogue in order to advance thinking on cumulative impacts and the drivers of environmental injustices. The panel discussed specific groups that should be present at these conversations: internal EPA staff, staff from federal agencies, staff from state agencies and regional bodies, academic researchers, tribal leaders, and community leaders. Specific topics of discussion should include the following:

1. Coordination of data sharing across jurisdictional boundaries (among state and federal partners);
2. Data gaps and data availability;
3. Methods and ways to account for regional variability of exposure (related to Topic Category 3);
4. Definitions of nationally consistent data for the purpose of EJScreen considering regional variability and uniqueness of place-based harms; and,
5. Methods to account for under and over-estimation of risk, impacts, and burden.

Recommendations:

Tier 1 (Major):

- The SAB recommends that the EPA increase the prominence of the option to display data from other sources via a map service or GeoPlatform to help users think about cumulative impacts or cumulative effects within the threshold maps (e.g., CalEnviroScreen, CEJST, EDF Proximity Mapping, etc.).
- The SAB recommends that if the EPA develops a single cumulative “score” or “index”, that there should be a well-defined purpose or question that this metric is trying to address.
- The SAB recommends that the EPA evaluate the feasibility and utility of “cumulative indices” that are based on subsets of the available indicators. These indicators could be organized into relevant categories that each address a specific concern.
- The SAB recommends that the EPA identify appropriate ways for EJScreen to inform users of cumulative “effects.”
- When the EPA is defining specific terms that are expressed as numbers (one single value) in EJScreen, such as “score”, the SAB recommends that the Agency use the term “index” or “assessment” instead, as it is both more accurate and prudent.
- If the Agency decides to include some sort of “score”, “index”, or “metric” of cumulative impacts in the context of EJScreen, the EPA should first define key terms clearly to ensure their consistent and correct use. Examples include “cumulative score”, “index”, or “metric” of cumulative effects, and

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“cumulative impacts”. If EPA develops or uses any metric or indicator of cumulative effects/impacts/burden, the SAB recommends a comprehensive explanation of what such “metric” or “indicator” does and does not say about a location or population to guard against misinterpretation.

- The SAB recommends that any indicator or metric that EPA develops by aggregating data values into a single number be consistent with the context of EJScreen as a tool for screening purposes.

Tier 2 (Short-Term):

- The SAB recommends that the EPA include a review of “cumulative impacts” analyses that have been done by the Agency and others in the technical documentation.

Tier 3 (Long-Term):

- There are no long-term recommendations for this question.

2.4.3. Charge Question 13: One technical difficulty in creating a cumulative score is the weighting of [environmental indicators](#). Please advise on specific approaches for combining the environmental indicators together into a single score, including how to appropriately weight the various indicators to represent the risk burdens more accurately. Please comment on methods to incorporate other factors into the score, such as [climate](#), [health](#), and other [social factors](#).

At this time, the SAB does not support any systematic weighting scheme or a structured weighting strategy due to the complications related to characterizing highly correlated variables and the subjective judgements that are needed. A structured weight may hinder the ability to add new relevant indicators as they become available. In this regard, no change to EJScreen is recommended by the SAB at this time. Instead, the SAB recommends the ability for individual users to apply customized weighting schemes, although the SAB cautions that the technical difficulties associated with those users’ weighting decisions are significant.

In any scoring system of the type suggested here, it is important to note that if indicators are added, averaged, ranked, or otherwise aggregated using simple arithmetic, the relative weights of the various components are assumed equal. There are several examples of attempts to change these relative weights, but there is not a great deal of evidence-based demonstration that can provide guidance for expressing these weights specifically or quantitatively. However, risk assessment principles, first advanced by the National Academy of Sciences (NAS), commonly apply numerical factors or multipliers to account for potential human sensitivity (as well as other factors such as data gaps) in deriving acceptable exposure levels. There are also few examples of this type of weighting in developing some sort of “cumulative score” to look to for guidance.

The current version of CalEnviroScreen’s screening tool has provided the most thoughtful and careful rationale for their weighting decisions (this is different from their decision to treat their “population characteristics” indicators as effect modifiers to their “pollution burden” metrics, mentioned earlier). Their technical documentation¹ for the current version of the tool includes this rationale and the evidence used to guide their weighting decisions. A careful reading of these explanations reveals that, in

¹ [CalEnviroScreen 4.0](#)

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1 many cases, relative weights were assigned based on recognition of “principles” that are “widely used
2 and accepted” by other agencies, or of their own assessment of relative importance between indicators;
3 for this reason, these weighting decisions are, in part, subjective. Examples include their decision to
4 weigh the “environmental effect indicators” less heavily than the “exposure indicators” based on the
5 premise that people may not necessarily be exposed to the former, their “weighted sum” approach to
6 define the Final Lead Risk from Housing Score, and their “weighting matrix” for sites undergoing
7 cleanup actions due to the presence of hazardous substances. Another source of information on relative
8 weighting is provided by the Centers for Disease Control and Prevention in their recently released an
9 Environmental Justice Index tool².

10
11 The SAB agrees with EPA that combining this diverse array of indicators is challenging, and that the
12 problem will become more fraught with the addition of more indicators. Another key challenge is that
13 many indicators are correlated with each other, and subject to double counting as mentioned earlier,
14 ultimately allowing some indicators to exert a disproportionate impact on any cumulative score. As an
15 example, New Jersey's EJMAP tool uses separate indicators for PM_{2.5}, cancer risk from diesel
16 particulate matter, and measures of mobile sources of air pollution - three separate indicators that all
17 reflect different estimates of PM_{2.5} exposure. However, each is counted separately in their cumulative
18 score, with a weight equal to any other indicator. Similarly, indicators related to a lack of greenspace -
19 such as inadequate of recreational spaces, rural areas, low percentage of tree canopy, and abundant
20 impervious surfaces³ are measures of very similar characteristics that are highly correlated but are added
21 separately into a cumulative risk score. Any cumulative score can benefit from numerous indicators, but
22 those that measure or reflect similar factors must be carefully considered in the scoring process.

23 Careful attention must also be paid to the relative contribution of any one indicator (at its relative
24 weight) on the overall score to avoid biasing the score by “overweighting” a given metric or issue.
25 CalEnviroScreen researchers have used sensitivity analysis extensively to determine the impact of
26 weighting choices on their final scores. Separating indicators into categories, as described earlier, will
27 allow for the incorporation of many indicators in one category (if they exist) without overwhelming the
28 importance of other categories. This is especially important in a more fit-for-purpose analysis. For
29 example, if EJScreen were to be considered in a National Pollutant Discharge Elimination System
30 (NPDES) permit approval, existing local water impacts would be a primary concern, with potential
31 climate impacts being of less importance. Similarly, a categorical approach could help address the
32 problem of screening metrics bias in favor of urban or industrial areas, as the available data used by
33 EJScreen and other screening tools is more focused on activities that are far less common in rural areas.

34 While there is lack of support for a systematic weighting scheme within EJScreen currently, there is
35 significant interest among users to have some capacity to emphasize some indicators over others for fit-
36 for-purpose applications. The SAB recommends that the EPA consider providing mechanisms within the
37 context of EJScreen where users can apply their own relative weights. The Agency should avoid
38 specifying weights or providing any guidance on what weights might be appropriate but might consider
39 commenting that different states could (and should) apply weights differently.

40 If the EPA decides to weight indicators, which the SAB is not recommending at this time,
41 comprehensive sensitivity analyses should be used to understand and scientifically justify the
42 contribution of any one indicator (at its relative weight) on an overall score, to avoid biasing the score
43 by “overweighting.” It should also be clear that a high value for a score or index does not by itself
44 demonstrate greater health or other impacts.

² <https://www.cdc.gov/media/releases/2022/p0810-environmental-burdens.html>

³ Note that these indicators do not currently exist in EJScreen but these indicators, or other like them, were suggested additions.

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Recommendations:

Tier 1 (Major):

- The SAB does not support any systematic weighting scheme as there is insufficient scientific basis for determining such weights. In addition, most of the EJScreen metrics do not include or provide the information needed to determine relative weights. The SAB recommends that the EPA avoid specifying weights or providing any guidance on what weights might be appropriate.

Tier 2 (Short-term):

- There are no short-term recommendations for this question.

Tier 3 (Long-term):

- The SAB recommends that the EPA consider providing mechanisms within the context of EJScreen where users can apply their own relative weights.
- While the SAB is not recommending the weight of indicators at this time, if EPA decides to pursue this approach, a comprehensive sensitivity analyses should be used to understand and scientifically justify the contribution of any one indicator (at its relative weight) on an overall score, to avoid biasing the score by “overweighting.” It should also be clear that a high value for a score or index does not by itself demonstrate greater health or other.

1 **2.5. Topic 5: Input on Better Consideration of Rural Geographies within EJScreen** (*Charge*
2 *Questions: 14, 15, and 16 – the original CQ14 is now 16, the original CQ15 is now 14, and the*
3 *original CQ16 is now 15)*
4

5 EJScreen is impressive in its detail, scientific quality, and ease of use, and documents appropriate
6 applications and known limitations of the tool with adequate clarity. Recent revisions to the tool are
7 logical and enhance functionality overall. The SAB commends the EPA for their effort expended to
8 develop, refine, and improve the tool.
9

10 The representation of rural communities is a major consideration for EJScreen, a consideration which is
11 a common theme throughout this report. The SAB offers both general and specific feedback pertaining
12 to each of the charge questions under Topic Category 5, in terms of: (a) defining rural areas; (b)
13 identifying nationally consistent datasets to document environmental justice issues for rural
14 communities; and (c) distinguishing rural from urban areas and incorporating calculations or
15 comparisons between rural and urban areas. The following points summarize overarching issues and
16 themes for Topic Category 5.
17

18 The SAB recognizes that environmental justice issues in rural areas are to some extent qualitatively
19 different from environmental justice issues in urban areas. Rural environmental justice issues are defined
20 by the typically peripheral status of communities and their economic integration as sites of extractive,
21 primary sector industrial activities, as well as by communities' particular resources, capacities, and
22 environmental assets. There is concern among the SAB that, through the process of selecting indicators
23 and developing calculation approaches, EJScreen inadvertently introduces biases that work against the
24 goal of identifying environmental justice issues in rural communities.
25

26 In rural areas, a lack of access to resources often underpins environmental justice issues. This includes a
27 lack of access to healthcare, food, social services, and basic public infrastructure such as clean water and
28 sanitation, broadband internet, and recreational spaces (e.g., greenspace). Environmental justice issues
29 among tribes, indigenous peoples, and migrant individuals are also of particular concern in rural areas,
30 as is the proximity of vulnerable population groups to pesticides, hazardous and industrial waste, animal
31 feeding operations, transportation noise, open dumping, and designated landfills, among other
32 environmental health hazards. The SAB agrees that indicators gauging the lack of access to resources
33 are not well represented in EJScreen. They also agree that the ability of users to quantify the lack of
34 access to resources in many rural U.S. communities should be systematically integrated within the core
35 indexes of EJScreen. Several nationally consistent data sources, described under Charge Question 15,
36 were identified by the SAB that can enable this quantification.
37

38 The SAB finds that pollution exposures related to primary sector economic activities including
39 agriculture and extractive industries (oil and gas or mining, etc., and infrastructures to process and
40 transport resources), as well as other environmental indicators (including environmental assets) that are
41 especially relevant to rural areas, are not well-represented in EJScreen. The SAB highlights nationally
42 consistent data sources, described under charge question 14, that can enable better integration of
43 environmental indicators relevant to rural community environmental justice issues in EJScreen.
44 Additionally, while EJScreen has included "climate change data" indicators relevant to rural
45 communities (e.g., flooding, wildfire, heat), those indicators are not integrated into the core EJScreen
46 indexes.
47

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1 Finally, EJScreen should enable users to distinguish rural areas from urban areas in examining or
2 exploring core EJScreen indexes. A topic of extensive discussion was how to operationally define rural
3 areas, given various alternatives. Several of the standardized and nationally consistent datasets with
4 definitional assumptions highlighted by the SAB can enable stratification of rural from urban areas
5 within EJScreen.

6 **2.5.1. Charge Question 14: Currently there is not a definition of rural communities in EJScreen.
7 To implement different calculations for rural and urban communities, EJScreen will need
8 to start by defining this term. What is an appropriate and scientifically defensible
9 definition of rural communities for use in an EJScreen context? (Original Charge Question
10 15)**

11
12 There are common characteristics of rural areas that shape community experiences (e.g., in terms of
13 populations, land uses, social services, community resources, infrastructure, isolation or lack of
14 connectivity, and environmental assets). There is no single definition of *rural communities* that
15 EJScreen should adopt because rural EJ issues differ regionally, and communities are situated along the
16 rural-urban continuum. While it is unnecessary for EJScreen to adopt a single definition of rural
17 communities, for the purpose of better considering rural environmental justice issues, operational rural-
18 urban continuum definitions based on existing, nationally consistent datasets could be adopted for use in
19 EJScreen.

20
21 The SAB recognizes the challenges with developing a definition for rural communities in the context of
22 EJScreen. Federal agencies do not have agreement on how to classify rural versus urban areas and the
23 estimates of rural populations range by orders of magnitude between about 7 million and about 70
24 million (Long et al., 2021). According to the Census Bureau, rural areas are defined as any territory,
25 population and housing units that are not located in an urbanized area or urban cluster. An urbanized
26 area is an area with a population of 50,000 or more, while an urban cluster has a population of at least
27 2,500 but less than 50,000. The U.S. Department of Housing and Urban Development (HUD) definition
28 is based on the Census Bureau's criteria of population density, geographic characteristics, and proximity
29 to urban areas. HUD defines rural areas in three ways; a place having fewer than 2,500 inhabitants, a
30 county or parish with an urban population of 20,000 inhabitants or less and any place with a population
31 not in excess of 20,000 inhabitants and not located in a Metropolitan Statistical Area (Davis et al.,
32 2022). The USDA's Rural-Urban Commuting Area Codes (RUCA) and Rural-Urban Continuum Codes
33 (RUCC) datasets are based on underlying rural-urban continuum definitions that are applicable in the
34 US Definitions are typically based on population size and density, proximity to larger population
35 concentrations, and commuting patterns or linkages. The FEMA does not have a specific definition for
36 rural areas, but uses the definition provided by Census Bureau to determine eligibility for some of its
37 programs and grants.

38
39 The SAB advises that the EPA also explore the utility of nationally consistent land-use and land-cover
40 datasets for the purposes of distinguishing places along the rural-urban continuum. The publicly
41 available 30-meter resolution [National Land Cover Database \(NLCD\)](#) dataset from the U.S. Geological
42 Survey (USGS) can be used for this purpose. The last publication of the NLCD was in 2016. There are
43 other more expensive, but higher resolution and more frequently updated options, like those found at
44 [Planet.com](#). Converting these raster data to polygons and calculating areas of a given land-cover
45 classification could provide reliable proxy measures for rural and urban areas.

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For the purpose of environmental justice, there should be a focus on where rural communities reside and the presence or absence of hazards, critical infrastructure and services. The SAB provides the following guidance on how the EPA can develop an appropriate definition of “rural” for the purposes of EJScreen.

Access to Resources

Rural areas are located outside of urban or suburban areas, often situated in agricultural or natural resource-dependent regions and have low population densities. These areas are commonly associated with limited access to critical infrastructure (e.g., sanitation, drinking water, paved roads, electricity, internet), services (e.g., health care, transportation, education, food, social services, legal services), and struggle with economic and social isolation, poverty, and limited job opportunities. One among several specific issues confronting many rural communities (in comparison to urban communities) is the relatively poor access to healthcare.

One challenge with defining rural communities is the differences between states and regions of the U.S. Thomas, et. al (2014) looked at the distinct cultural, geographic, and economic differences between three rural counties in the state of Georgia. If the EPA moves forward with a single definition of rural, the metric will need to be carefully researched and vetted. Characteristics of rural Wisconsin differ from those of rural North and South Dakota or eastern Montana. The [Am I Rural? Tool](#) offers a comparison of what is currently used for federal definitions of rural. The RUCA and Frontier and Remote Area (FAR) codes offer a potential metric to use for “ruralness.” However, the SAB notes that the EPA would need to research further before incorporating the metric into the EJScreen tool. FAR codes appear to be a good first choice for further exploration, since they consider goods and services that are typically found in larger cities. For rural communities, the SAB considers goods and services to be a key metric.

Recommendations:

Tier 1 (Major):

- The SAB recommends that the EPA systematically examine rural-urban continuum classifications in existing, nationally consistent datasets, to determine which classification is best-suited for integration within EJScreen. Nationally consistent definitions that would be appropriate are RUCA, RUCC or FAR Codes. Some of these classification systems implicitly incorporate the limited or lack of critical infrastructure and access to services that in many ways are defining characteristics of rural communities captured by the U.S. Census Bureau urban and rural definitions. The EPA should use direct field observation (i.e., ground truthing) as well as rural states and rural community input to identify the best-suited classification systems.
- The SAB recommends that the EPA research, with input from rural states, organizations, and communities how to optimally integrate a rural-urban continuum classification into the EJScreen platform to enable stratification of census block groups and comparisons at national and state levels, and then implement rural-urban stratification functionality within EJScreen.

Tier 2 (Short-term):

- There are no short-term recommendations for this question.

Tier 3 (Long-term):

- The SAB recommends that the EPA revisit whether an explicit definition of *rural communities* (or *urban communities*, or other communities situated along the rural-urban continuum) is needed based on user feedback and research regarding the strengths and limitations of implementing rural-urban stratification functionality in EJScreen.
- The SAB recommends that the EPA consider the use of national land use land cover datasets for classifying areas along the rural-urban continuum.

2.5.2. Charge Question 15: What currently available, nationally consistent, environmental datasets could be used to identify vulnerable rural communities overburdened by pollution? (Original Charge Question 16)

Nationally consistent datasets exist that can be used to identify rural communities as well as other communities across the rural-urban continuum. While the integration of new “climate change” indicators or data within EJScreen improves its capacities for considering rural geographies, additional environmental, social, health, and infrastructural datasets exist that can be used for the purpose of better identifying rural community environmental justice issues (e.g., datasets from the EPA, CDC, DOE, Department of Defense (DOD), USGS, etc.). Use of *environmental* datasets alone is insufficient for this purpose, and environmental datasets selected for use in EJScreen should encompass more than indicators of *pollution*.

Climate Impact Datasets

The First Street Foundation flood risk and wildfire risk datasets would be useful for rural areas. One measure especially useful would be “federally-overlooked 100-year flood risks,” a measure based on erasing FEMA 100-year flood zones (i.e., “Special Flood Hazard Areas”) in areas of overlap with First Street Foundation-delineated 100-year flood zones. Those federally overlooked areas have very low rates of flood insurance and other resources to protect against flooding, and many are in rural areas (unmapped by FEMA; Flores et al., 2023). An additional resource for climate change related hazards (i.e., floods and wildfires) would be Environmental Systems Research Institute (ESRI) Climate mapping for resilience and adaptation (<https://resilience.climate.gov/>). This mapping tool displays drought, inland flooding, coastal flooding, wildfire, and extreme heat.

Healthcare Access and Health-Related Datasets

Health care issues associated with the potential health impacts of pollution could be a proxy for pollution data themselves. Access to healthcare would be an indicator, since rural communities tend to have far fewer doctors, specialists and hospitals in their neighborhoods as compared with urban communities. As cited in Long et al. (2021), the Provider of Services dataset (hospitals) and National Plan and Provider Enumeration System (physicians and dentists) are both available for the nation. The NPES datasets are available by zip code. Additional social indicators such as health insurance status could be used to identify vulnerable populations.

A tract level dataset is the Healthcare Access Indicators, CDC PLACES. The following two measures might provide a gauge for low healthcare access in EJScreen (perhaps as part of the supplemental

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index): [Current lack of health insurance among adults aged 18–64 years](#) and [Visits to doctor for routine checkup within the past year among adults aged ≥18 years.](#)

The CDC through its National Center for Health Statistics (NCHS)

https://www.cdc.gov/nchs/data_access/ftp_data.htm provides downloadable public-use data files related to multiple national health care statistics and health care surveys. NCHS also provides data linkages to other federal agencies health-related data (e.g., National Death Index (NDI) mortality data).

The Rural Health Information Hub provides information and resources on rural health issues. The site provides access to recent and reliable resources and tools to help understand rural needs and how to address them.

Infrastructure Datasets

Some nationally consistent data that could speak to infrastructure include the U.S. Energy Information Administration (EIA) Natural Gas Processing Plants data found [here](#) and their [pipeline data](#), EPA’s own [Facility Level Information on Greenhouse Gas Tool \(FLIGHT\)](#), and even the EIA inventory of producing and idle coal mines [here](#). However, the SAB cautions the EPA that the EIA Plants data are out of date in places, including Southwest Pennsylvania, the Panhandle of West Virginia, and Eastern Ohio. The SAB has the concern that the EIA Pipeline data and similar polyline files are being generalized in the name of National Security. In order to incorporate the FLIGHT data accurately they would need to be coded across industries and that is something that FracTracker Alliance has done [here](#). The coal mine data needs to be more fully explored as much of this data are represented as point features. However, deep and surface mines should be represented as polygons instead of points because of their larger size-- something for the EPA to consider with respect to accessing Federal Government satellite repositories.

It would be beneficial for communities with environmental justice concerns if the EJScreen tool were to separately include plastics producing facilities or producers. Regarding plastics and the need for a nationally consistent dataset, [the U.S. Securities and Exchange Commission \(SEC\)’s EDGAR database](#) may be a potential source. This database is a valuable source of information as it pertains to plastics producers as well as fertilizer producers with concentrated footprints in more rural areas of Florida and Louisiana’s Cancer Alley.

Additionally, the types of nationally consistent data that would address environmental justice issues in rural areas include controversial but established renewable energy sources like [wood pellet facilities in lower income and minority communities in the Southeast](#). Other aspects to consider incorporating into a mapping tool to address rural area concerns especially around air quality and noise pollution include biodiesel plants, ethanol refineries, and potentially even large-scale methane digesters. These types of nationally consistent data [do exist](#) as organizations have generated them by way of data scraping exercises from industry websites.

Title V facilities are continuing to modify their permits and are clearly point sources of pollution and a source of environmental justice concern in rural areas like West Virginia.

The EPA could add a comprehensive inventory of facility incidents like major fires or hazardous chemical spills in EJScreen. These incidents frequently occur at refineries around the country and appear to be increasing in recent years. Communities with related environmental justice concerns include

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1 Southwest Detroit adjacent to Marathon Refinery, Southeastern Philadelphia, and several neighborhoods
2 in Corpus Christi and Houston, Texas.

3
4 Datasets for Environmental and Social Indicators to Identify Rural Communities Nationwide

5
6 For datasets with county level information, the EPA could consider using Pesticide Pollution; USGS
7 Pesticide National Synthesis Project (public). The EPA would want to first select block groups within a
8 buffer distance from agricultural areas based on land cover classification (e.g., using Land Cover
9 Classification, National Land Cover Database (public)), and then assign pesticide risks for those block
10 groups within counties. To effectively utilize the dataset the EPA would have to select pesticides of
11 particular concern, as many pesticides are included in the database.

12
13 For a dataset at the census tract level that includes social indicators highlighting lack of resources
14 relevant to the environmental justice issues in rural areas, the EPA could consider utilizing Social
15 Environment Indicators; National Neighborhood Data Archive. Examples of social indicators include:
16 [food](#) (grocery stores, convenience stores, and restaurants); [health care services](#) (e.g. physicians, dentists,
17 mental health providers, hospitals, nursing homes, pharmacies); [social services](#) (food banks, child day
18 care services, family social service agencies); [law enforcement organizations](#); [voter registration, turnout,](#)
19 [and partisanship](#). To highlight food access issues in rural areas, the EPA could consider utilizing Food
20 Access Research Atlas; USDA (public). This may be perceived as diverging from the focus of EJScreen,
21 however it would not diverge any more than measures of health vulnerability. National Agricultural
22 Imagery Program (NAIP) provides high resolution aerial imagery of agricultural lands across the US.
23 The data can be used to identify areas with intensive agriculture and potential sources of pollution, such
24 as fertilizer and pesticide runoff.

25
26 A health disparity metric that would be helpful in identifying rural communities with environmental
27 justice concerns would be one that would illustrate the degree to which the opioid epidemic has affected
28 a given community. Most of the rural communities in the Ohio River Basin have seen their parent-aged
29 population hollowed out by opioids leaving the older generation to take care of the children
30 [REFERENCE NEEDED]. These latter two variables are captured by the EJScreen tool but something
31 that could speak to the rate of change in these two in combination with data on opioid severity would
32 capture maybe the #1 or #2 health disparity/impact in rural America today would benefit the tool.

33
34 National Wetlands Inventory (NWI): The NWI provides information on the locations, types, and extent
35 of wetlands across the U.S. The data can be used to identify areas that are at risk of flooding or other
36 water related hazards, which will negatively affect vulnerable populations living in rural areas. USDA
37 Natural Resources Conservation Services (NRCS) Soil Survey provides detailed information on soil
38 properties, including soil types, depth, and drainage. The data can be used to identify areas with high
39 levels of soil contamination, which could potentially affect the health of rural communities.

40
41 A database to separate noise estimates by transportation source, including aviation, road, and rail, the
42 EPA could consider using the National Transportation Noise Map (Bureau of Transportation Statistics,
43 public). In particular, the rail noise estimates might be relevant to rural contexts.

44
45 For a census block group method, the EPA could consider Domestic Well Locations and Populations
46 Served in the Continuous U.S.; USGS (public). This could be highly correlated with reliance on septic
47 tanks. Utilizing this dataset might require collaboration with USGS. Water quality in wells would be a
48 critical environmental justice indicator to include, and the EPA may have data readily available.

1
2 Under the “Pollution and Sources” drop down tab the tool speaks to “Wastewater Discharge” and is a
3 good metric that appears to be relatively granular. However, the SAB would suggest strengthening it by
4 adding [Combined Sewer Overflow \(CSO\) point sources of pollution](#). This is a dataset created using data
5 provided by EPA that were not official, as no QA/QC was done (Billah, personal comm., 2013 -
6 REFERENCE CLARIFICATION NEEDED).

7
8 The following agricultural indicators of environmental justice could include: [biosolids spreading](#)
9 operations and rates of spreading, The USDA Agricultural Census digitized [here](#), Industrial Confined
10 Animal Feeding Operations (CAFOs) and associated manure slurry impoundments, and Carbon Capture
11 and Storage Pipeline Infrastructure, which has the potential to be a significant environmental justice
12 issue in rural areas.

13
14 The SAB cautions the EPA in the language of talking about “pollution” and the realities of the economy
15 of rural America. The economy of rural America can include farming, ranching, and energy or mining or
16 extractive industries. People who live in rural communities want both a clean environment and a good
17 paying job that can keep them living in their community. The SAB urges the EPA to maintain, and if
18 needed establish, a good working relationship and partnership with state agencies and rural communities
19 to ensure proper consideration of rural communities with environmental justice concerns. Additionally,
20 USDA Rural Data Gateway dashboards are easy-to-use tools that highlight critical Rural Development
21 investments for people in rural America, including projects that have helped people in socially
22 vulnerable communities access the resources they need to thrive.

23
24 The types of data that would enhance the view of rural areas and bring their environmental justice scores
25 down include proximity to national parks and forests, wildlife refuges, etc. This would be something that
26 would lift their scores while lowering those of urban environments. Similarly, the “Food Desert”
27 indicator seems to need significant improvements given its failure to capture so much of what is a food
28 desert in cities like Cleveland, Ohio and Detroit, Michigan.

29
30 Other sources of data that need to be incorporated include legacy and unconventional wells all over rural
31 America. This should also include all manner of associated infrastructure including but not limited to
32 natural gas compressor stations, [gas gathering pipelines](#) which [have altered more of the Marcellus/Utica](#)
33 [region of the Pennsylvania, West Virginia, and Ohio](#) than coal mining, wastewater impoundments, and
34 Class II Salt-Water Disposal (SWD) Wells which tend to be nationally-consistent even in states where
35 EPA does not have primacy. The latter oftentimes are clustered in thin bands of states like Michigan or
36 replete across whole states like Oklahoma and Kansas. This infrastructure has a particularly acute
37 environmental justice impact on reservations like Standing Rock and Fort Berthold Reservations in The
38 Dakotas or the Osage Reservation in Oklahoma which is surrounded by Class II SWD wells.

39 40 Intra-Agency Coordination

41
42 Using agriculture as an example, more coordination between the EPA and USDA could be helpful. For
43 example, in addition to other agricultural data, USDA Economic Research Service (ERS) research and
44 analysis covers a broad range of economic indicators related to nutrition such as U.S. food security, food
45 and nutrition assistance programs, food access and store proximity, food retailing and marketing, and
46 food prices. While some of these indicators overlap with percent low-income, they could assist in
47 identifying vulnerable rural communities.

1
2 Input on Datasets Currently *Not* Available/Known

3
4 The SAB notes these *potential areas for future research* to inform rural communities and related
5 databases:

- 6
7 • A nationally consistent oil and gas well or fracking database.
8
9 • A database on agricultural pesticide risks.
10
11 • A dataset on residential reliance on private water wells or tanks and/or residential reliance on
12 septic tanks.
13

14
15 **Recommendations:**

16
17 **Tier 1 (Major):**

- 18
19 • The SAB recommends that the EPA systematically examine nationally consistent datasets to
20 determine which are best suited for integration within EJScreen. In Table 1, the SAB provides a list
21 of possible rural geographies databases for EPA’s consideration.
22

23 **Tier 2 (Short-term):**

- 24
25 • The SAB recommends that the EPA systematically examine environmental, social, health, and
26 infrastructural datasets identified by the members and select indicators that are applicable to rural
27 environmental justice issues for inclusion in EJScreen (*see the attached dataset table*). While the
28 SAB recognizes that EPA wishes to utilize only nationally consistent datasets, we recommended
29 more flexible utilization of high-quality datasets in EJScreen because some environmental justice
30 concerns in rural communities are regionally distributed, and in such cases the concept of “nationally
31 consistent” is inapplicable.
32

33 **Tier 3 (Long-term):**

- 34
35 • The EPA should consider integrating indicators of pro-environmental actions (e.g., safe drinking
36 water compliance or lack of significant non-compliance violations, infrastructure investments,
37 environmental justice project implementation, etc.).
38
39 • The EPA should determine how to optimally integrate calculation approaches in the EJScreen
40 platform for the newly selected environmental, social, health, and infrastructural indicators to ensure
41 fuller representation of places along the rural-urban continuum. This includes determinations
42 regarding how to perform indicator calculations and how to include newly selected indicators within
43 the EJScreen tool (i.e., as Environmental Justice Indexes, Supplemental Indexes, as standalone
44 indicators, or within new domains/buckets).
45

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1 **2.5.3. Charge Question 16: Currently there is no differentiation between urban and rural**
2 **communities within EJScreen. The tool uses the same calculations and indicators for the**
3 **entire country. Please comment on: (a) whether EJScreen should incorporate different**
4 **calculations or levels of comparison for rural vs urban locations to ensure fuller**
5 **representation of both locations in the tool; (b) how the tool could better represent rural**
6 **and urban locations? (Original Charge Question 14)**

7
8 The SAB recognizes that it can be difficult to incorporate data and indicators and develop calculations to
9 adequately address environmental justice issues for every community across the diverse geography and
10 demographics of the U.S. Assessing environmental justice nationwide requires a comprehensive
11 approach that considers both environmental and social factors as well as how those factors vary across
12 the rural-urban continuum. Environmental justice assessment in rural areas also requires consideration
13 of factors that contribute to vulnerability and injustice that are unique to rural areas. Therefore, it is
14 critical to work with rural states, and rural community members and organizations to ensure that the
15 assessment, EJScreen, including indicator selection and calculations are informed by local knowledge
16 and priorities. A major benefit of the EJScreen tool is that it provides flexibility for users to add their
17 own data and develop a screening level assessment for their community. The SAB believes, however,
18 that the current tool can be improved to better help people in rural communities and rural states screen
19 for environmental justice issues in their communities.

20
21 **Charge Question 16A: Discussion about whether EJScreen should incorporate different**
22 **calculations or levels of comparison for rural vs urban locations in the tool.**

23
24 Rural areas are among the frontline communities that experience continuing injustice due to a legacy of
25 systemic, largely racialized, inequities that influence their living and working places, the quality of their
26 air and water, and their economic opportunities (Mohnot et al., 2019). The SAB recommends that the
27 EPA research, as proposed in recommendations in other charge questions under Topic Category 5, how
28 to best incorporate different calculations for rural and urban locations to include the contextual relevance
29 of environmental burdens of rural populations compared to urban centers for EJScreen.

30
31 The SAB recommends that the EPA consider differential weighing of indicators across the rural-urban
32 continuum. This is because some factors (e.g., pesticide exposures, wildfire hazards) may be more
33 relevant in rural contexts, while other factors (e.g., traffic-related air pollution, extreme heat) may be
34 more relevant in urban settings.

35
36 **Charge Question 16B: Discussion about How the tool could better represent rural and urban**
37 **locations.**

38 Rural Indicators

39
40
41 Rural indicators include environmental hazards directly related to air, soil, and water contaminants from
42 both point and nonpoint sources such as agricultural operations (e.g., CAFOs, manure and other waste
43 byproducts, sprayfields, pesticides, synthetic fertilizers) (Galarraga et al., 2022; Hall et al., 2021;
44 Khanjar et al., 2021; Oun et al., 2014; Thundiyil et al., 2008; Wilson and Serre, 2007). Pesticides are a
45 major source of occupational injury for farmworkers. Many dangerous pesticides that have been banned
46 or categorized as “extremely hazardous” by international organizations continue to be sold and sprayed
47 in the U.S. When unaccounted for, particularly among “hidden” populations such as migrant workers,
48 the tool fails to capture the neurocognitive and respiratory health effects associated with exposure. The

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1 tool should also include indicators related to rural energy generation, burden, and infrastructure (i.e.,
2 Wi-Fi, well water) (Ravichandran, et al., 2021; Touati et al., 2018 - CITATION NEEDED).

3
4 Rural indicators should track the lack of basic amenities that characterizes many rural communities.
5 Studies have shown that unincorporated areas tend to have “hidden” populations which are abandoned
6 by environmental protections. For example, the unincorporated, highly Latino, farm working
7 communities in San Joaquin Valley, California, have been suffering from high drinking water
8 contamination as well as indoor penetration of chemicals from heavy oil combustion activities (Balazs
9 and Morello-Frosch, 2013). The Roger’s Road landfill is another case study of environmental injustice
10 pertaining to the neglect of unincorporated areas. In their decision to position a landfill, Orange County
11 commissioners cited the area’s sparse population (roughly 85 households) and considered it less
12 objectionable than the previous proposed site. A study found poor private household water quality and
13 sewer infrastructure failures within this community, attributed to the nearby landfill (Heaney et al.,
14 2013). The West End Revitalization Association (WERA) is a community-based organization in
15 Mebane, North Carolina. Many of the communities that WERA represents are unincorporated post-
16 slavery Black neighborhoods established during Reconstruction. These communities are between 85-
17 95% Black, primarily elderly and retired citizens; 53% earn less than \$20,000 per year (WERA, 2002).
18 Residents in these communities have been threatened by the 119-bypass/interstate, a 27-mile four-lane
19 highway connecting Interstate 85 and 40 from Mebane to Danville, Virginia. This is further exacerbated
20 by the fact WERA communities have been lacking sewer and water infrastructure, paved roads, and
21 stormwater management for decades. This, in turn, depresses affordable housing and impedes upgrades
22 in housing quality. The impact of the lack of unincorporated areas within the framework of the EPA EJ
23 Index and not assigning different weights for rural indicators may undermine the effectiveness of the
24 tool.

25
26 The IEc Advancing EJScreen Report (2022) provides suggestions for additional environmental
27 indicators for rural areas that are not included in EJScreen, although the challenge is whether nationally
28 consistent datasets are currently available for these indicators. This effort of including additional
29 indicators for rural areas could also consist of adding more items to the “critical service gaps” menu in
30 the EJScreen tool that include all the above-mentioned critical infrastructure and services.

31
32 Rural communities are more likely to experience proximity to agricultural fields, animal feeding
33 operations, extractive industries (mines) or landfills and be exposed to the negative impacts of such
34 facilities (e.g., pesticides, heavy metals, leachate). Migrant workers, for example, are disproportionately
35 affected by the use of pesticides in agriculture [REFERENCE NEEDED]. Therefore, the tool could
36 incorporate proximity to agricultural fields, mines, energy plants, and other natural resource- dependent
37 areas.

38
39 Furthermore, it would be ideal to add immigration status as a demographic indicator, although this
40 demographic indicator is not included in the U.S. Census or ACS and there are sensitive issues for
41 reporting this information. However, the tool should be able to identify a population especially
42 vulnerable to environmental justice issues, particularly as climate change unfolds and immigration will
43 likely continue to increase.

44
45 Another key population to consider is tribes and indigenous peoples. They tend to live in rural areas
46 (reservations) and are isolated from critical infrastructure and services. They are disproportionately
47 exposed to hazardous waste from uranium mines and water contamination. Indigenous people’s
48 communities are at the forefront of justice issues [REFERENCE NEEDED].

1
2 A key issue with rural communities is the lack of opportunities for youth to remain there, so the
3 population tends to include older adults that lack the support of younger family members or a younger
4 workforce in general [REFERENCE NEEDED]. Ageing population should be added to the
5 demographics to calculate the EJ Index for rural areas.

6
7 Climate change-related disasters disproportionately affect the agriculture industry, which is the
8 backbone of rural communities [REFERENCE NEEDED]. Floods and wildfires kill animals (livestock
9 and wildlife) and people and displace people. Communities without insurance suffer the most. The tool
10 could incorporate the level of insurance protection in rural areas.

11
12 In many cases, rural communities face a lower level of connectivity with other communities. For
13 example, when there is only one road leading to a rural community and this road is damaged during a
14 storm event, the community would find itself completely isolated. The EPA could consider developing a
15 rural isolation indicator based on road access to characterize that dimension of vulnerability.

16
17 Rural, suburban, and urban should be treated differently in the context of EJScreen. For example, each
18 block group could be classified as rural, urban, or suburban, using the FAR codes' rural classification
19 scheme set forth by the Department of Agriculture. This classification scheme was recently found to
20 capture the rural urban divide most effectively when considering public health (Long et al., 2021). Then
21 a "disadvantage" metric or multiplier could be added to rural coded block groups, since those block
22 groups have less access to medical care and specialists overall. Or a "rural health disparity" indicator
23 could be added to the EJScreen list of indicators. Then a "rural" toggle should be made available for the
24 percentiles, so that the user can specify to only compare to the same rurality in block groups in the
25 county, state, or country. By comparing rural-to-rural block groups, some of the disparities that are not
26 captured by lumping urban and rural groups together could be illuminated.

27
28 A major challenge is that many of the pollution environmental indicators in EJScreen are relatively less
29 impactful in rural than urban areas. In terms of anthropogenic pollution specifically, extractive, or
30 primary sector industrial pollution exposures are not well-represented in U.S. environmental databases.
31 The integration of health indicators to represent challenges to accessing healthcare in particular would
32 be useful to address rural vulnerability.

33
34 The option to stratify block groups for analysis in EJScreen based on urban-rural status using RUCA
35 codes is another option. The SAB recommends providing this option to users interested in distinguishing
36 environmental justice issues in rural areas.

- 37
- 38 • RUCA codes at the census tract level based on the 2010 Decennial Census are currently
39 available; 2020 RUCA codes are in production. See: [https://www.ers.usda.gov/data-
40 products/rural-urban-commuting-area-codes/](https://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes/). It would be easy to apply the tract codes to the
41 block groups within tracts.
 - 42
43 • An alternative would be to define all block groups in a county as urban-to-rural based on RUCC
44 codes. See: <https://www.ers.usda.gov/data-products/rural-urban-continuum-codes/>. These are at
45 the county level. The most recent codes are for 2013; updated codes will be available later this
46 year.
- 47

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- There are other rural-urban classification schemes (e.g., FAR codes, noted above), but those two (RUCA and RUCC) are tailored to the US context and widely used.

Recommendations:

Tier 1 (Major):

- The SAB recommends that the EPA conduct research, with input from rural states, rural organizations, and communities, on how to optimally integrate indicators into the EJScreen tool and enable stratification of census block groups and comparisons at national and state levels, and then implement rural-urban stratification functionality within EJScreen.

The SAB has no recommended calculations at this time, but the SAB recommends that EPA conduct research on how different calculations or levels of comparison for rural versus urban locations can be incorporated to ensure fuller representation of both locations in the tool. By incorporating different calculations for rural and urban communities, EJScreen can provide a more accurate understanding of localized environmental justice issues. This helps policymakers and community groups develop targeted strategies to address environmental injustices and promote environmental equity more efficiently. As discussed earlier in this report, there are multiple existing rural-urban classifications that can be integrated in EJScreen to better represent the variation in environmental justice issues across the rural-urban continuum as well as multiple nationally or regionally consistent datasets that could incorporate rural environmental justice concerns.

Tier 2 (Short-term):

- The EPA should consider relaxing criteria for nationally consistent datasets to provide high-quality data that can be used in calculation or as regional indicators of environmental concern specifically for rural areas.

Tier 3 (Long-term):

- The SAB recommends that EPA systematically and empirically assess the impact of adding specific rural indicators to the tool and assess whether those added indicators provide a better representation of the environmental justice aspects of rural communities.

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7

LIST OF TABLES

Table 1: Possible Rural Geographies Databases for EPA’s Consideration.
[This information has been posted on the SAB website as part of the meeting materials for the EJScreen Review Panel public meeting to be held on August 14, 2023.]

APPENDIX A: EDITORIAL CORRECTIONS

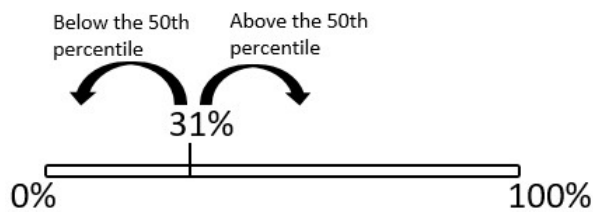
Appendix (Topic 2) – Detailed comments on the current version of the technical document.

Below please find a list of detailed comments that members have raised. These comments refer to specific pages in the current version of the Technical Documentation:

Page 4: At first mention of census block groups, it would be helpful to define or provide a link to the U.S. Census Bureau definition of a block group. This would help users understand the level of spatial resolution of the tool.

Page 5: The Summary Overview of Socioeconomic Indicators states that “EJScreen uses socioeconomic indicators as very general indicators of a community's potential susceptibility to the types of environmental factors....”. However, no justification is provided as for why these indicators are deemed “very general”.

Page 6: It might be more useful to provide a visual representation of the described calculations. For example, when describing a demographic variable “Percentage of People of Color”, in addition to the text, it could be less ambiguous if a diagram like the one below showing what a percentile is, is included in the documentation as well.



Page 7: In describing the calculations used to derive the percentage of the population living below the poverty line, it was mentioned the adoption of twice the poverty limit as threshold for identifying people in poverty. Despite the technical documentation stating that ‘many studies in various fields use 2x poverty’, no specific references to support this decision is provided.

Page 11: The formula to calculate the percentage of the population with less than high school education is missing B15002.027 from the numerator.

Page 13: Please spell out PM2.5 and Diesel PM the first time these terms are mentioned in the documentation. It would be helpful to provide a link to the EPA webpage that gives basic information on Particulate Matter (PM) rather than the one currently linked.

Page 17: No explanation as for what ‘HI’. Please spell this word out and provide an explanation and a reference for the user.

Also, there is a typo under “What is the air toxics respiratory HI indicator?”. This paragraph refers to the non-cancer health effects, and the word “carcinogens” is unintended.

Page 14 and Page 22: There is inconsistent information. On page 14, wastewater discharge is described as “RSEI modeled Toxic Concentrations at stream segments within 500 meters, divided by distance in

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1 **km**". On page 22, it is described as "divided by distance in **meters**". Even though this might not change
2 the results quantitatively, the documentation should be as consistent as possible.
3

4 **Pages 20 - 23:** As done for other environmental indicators, please provide resources and links to other
5 EPA webpages for readers to access more information about Superfund sites, RMP facilities, and
6 UST/LUSTs.
7

8 **Page 26:** It is unclear why a user would use the Demographic Index vs the Supplemental Demographic
9 Index. The documentation says that the Supplemental Demographic Index 'replaces' the current
10 Demographic Index. When using EJScreen, the Supplemental Demographic Index is not replacing the
11 Demographic Index, instead the user has the choice to use one or the other. It would be great to provide
12 some documentation that justifies this choice.
13

14 It is unclear why it is not allowed to use these two indices (Demographic Index and Supplemental Index)
15 together (combined as one) as well as separately. It is not clear why the supplemental index include
16 income and not race/ethnicity. The current session 'What is the Supplemental Demographic Index in
17 EJScreen' doesn't sufficiently answer these questions nor does the section 'Why is the Supplemental
18 Demographic Index in EJScreen?' on page 29. The text refers to communities needing to contact a legal
19 office, but no explanation or justification for this sentence is provided. There seems to be an underlying
20 current of knowledge that the user is supposed to know about this index that is not plainly stated.
21

22 **Page 29:** For the EJ Index example and others throughout the document, what was the reasoning for
23 choosing to use 15 significant figures? This can feel and seem a little cumbersome to the reader.
24

25 **Page 29:** The text states "EJScreen features two sets of indexes—12 EJ Indexes and 12 Supplemental EJ
26 Indexes, which are described in detail below. The indexes are a combination of environmental indicators
27 described above and the Demographic Index, or the Supplemental Demographic Index described
28 above."
29

30 It is unclear if the text is referring to individual environmental indicators or to combined indicators? It
31 would be helpful to bring clarity to this language. Similar language is used on Page 30.
32

33 **Page 30:** It is unclear what "Supplemental Index Percentile in USA = 50" means at the end of the
34 calculation on this page.
35

36 **Page 31:** No page number. In the section on color-coding of percentile bins, the documentation states
37 that "There is no official policy significance assigned to each individual color on the maps..". It would
38 be helpful to understand the motivation for choosing to display the 80th percentile and not, for example,
39 the 75th percentile. Providing some documentation on the choice of the percentile cutoffs adopted would
40 be extremely helpful.
41

42 **Page 33:** The documentation states that percentiles are calculated using functions like `wtd.quantile()` and
43 `wtd.Ecdf()`. However, it is not clear what weights were used in these functions? It seems that the current
44 percentile is unweighted, but it is not clear.
45 The paragraph above 'How Percentiles are Calculated' could benefit from a visual example to clearly
46 show the differences and/or similarities of State versus US in terms of both indicator values and
47 percentiles.
48

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1 **Page 34:** It is unclear what the expression ‘101 Percentile bin counters (0 to 100)’ refers to.
2

3 **Page 35:** The sentence in the last paragraph, “This 80th percentile filter is for internal EPA use and is
4 not intended to apply to States or other organizations” seems out of place. The entire paragraph
5 suggested the 80th percentile as a starting point and described its use but the last sentence seems very
6 “legalese.”
7

8 **Page 36:** Third paragraph, last sentence. It seems that “areal apportionment of blocks” should in reality
9 be “population apportionment of blocks” since the sentence before referred to how areal apportionment
10 is less accurate.
11

12 **Page 40:** Similar to the suggestions provided above, a graphical/visual representation of the calculation
13 used to derive proximity to facilities would be helpful and would enhance comprehension of these
14 topics.
15

16 **Page 42:** It would be beneficial to have access to the references the EPA team reviewed in coming up
17 with solutions to the problem of small d_{ij} values. In general, decisions regarding what methodology to
18 use or what distance threshold to use, should be supported by scientific evidence. With the exception of
19 links to EPA webpages, there are no references provided with the entire technical documentation. If
20 these are available, they should be included.
21

22 **Page 48:** According to the CDC, “PLACES is a collaboration between CDC, the Robert Wood Johnson
23 Foundation, and the CDC Foundation.” It would be great if the Agency could elaborate more on what is
24 the expected continuity of these data and the expected availability in the future. Additionally, it would
25 be helpful to know whether EPA has engaged in discussions with other Federal agencies about data
26 sharing and data continuity, both fundamental for the longevity of comprehensive tools like EJScreen.
27

28 Although, potentially out of the scope of EJScreen, it might be helpful for users and researchers to know
29 whether Federal agencies have coordinated or are working on coordinating data use between various
30 group so to facilitate and optimize the tools that each federal agency produces. This question is due to
31 the fact that the PLACES dataset was started as a project that developed further partnerships.
32

33 Such information would allow users to get a better idea about the longevity of certain data sources.
34 Given the reliance of EJScreen on multiple data sources, information regarding the longevity and quality
35 control of the raw data is important as it will ultimately impact EJScreen either in a positive or negative
36 way.
37
38