New York State Climate Justice Working Group
2023 Disadvantaged Communities Criteria

Final Report

January 14, 2025

Table of Contents

List of Tables

List of Figures

Preferred Citation

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE CLIMATE JUSTICE WORKING GROUP 2023 DISADVANTAGED COMMUNITIES CRITERIA FINAL REPORT.

1 INTRODUCTION

On July 18, 2019, New York State (State) signed into law the Climate Leadership and Community Protection Act (Climate Act). The Climate Act is among the most ambitious climate laws enacted in the United States, not only for its bold greenhouse gas (GHG) reduction and renewable energy requirements, but also with respect to the law's incorporation of equity considerations. A cornerstone of the Climate Act is identifying and considering disadvantaged communities (DACs) in regulatory actions and implementation of the Climate Act. Under the Climate Act, DACs are defined as "communities that bear burdens of negative public health effects, environmental pollution, impacts of climate change, and possess certain socioeconomic criteria, or comprise high-concentrations of low- and moderate- income households."[1]

Climate change impacts everyone. However, New Yorkers do not experience environmental burdens or climate change vulnerabilities equally across the state. Climate change is a threat multiplier, which means its impacts can be further exacerbated by existing vulnerabilities or stressors that sean can add increasing burdens to local communities. In accordance with the Climate Act, the Climate Justice Working Group (CJWG) was established by the New York State Department of Environmental Conservation (NYSDEC) to establish the criteria by which DACS would be defined under the Climate Act. The CJWG, along with staff from NYSDEC, the New York State Energy and Research Development Authority (NYSERDA), the New York State Department of Health (NYSDOH), and the New York State Department of Labor (NYSDOL) (collectively, State Agencies), with the assistance of subject matter experts from ILLUME Advising and Abt Associates (Consultants):

1. Determined the appropriate geographic units for identification;
2. Established an iterative process for criteria selection;
3. Captured the burdens of existing Environmental Justice communities in addition to the vulnerabilities anticipated by climate change; and
4. Identified methodologies for scoring communities based on the criteria.

The CJWG voted on December 13, 2021, to approve draft criteria to identify DACs for the purposes of co-pollutant reductions, GHG emissions reductions, regulatory impact statements, and the allocation of investments related to Article 75 of the Environmental Conservation Law (ECL). The draft criteria and draft list of census tracts of identified DACs were available for public review during a 150-day public comment period, including a public participation process.

Following the public comment period, the CJWG deliberated for several months to discuss the approximately 3,000 public comments received and how these comments would be incorporated into the DACs criteria. The CJWG reviewed multiple proposed indicators and methodological changes. More information on the public comment process can be found in section 8.3.

On March 27, 2023, the CJWG voted to finalize the criteria. The CJWG voted to include the 45 indicators of environmental burdens, climate change risks, population characteristics, and health impacts. The CJWG also voted to include low-income households in the definition of DACs for the purposes of the allocation of investments. Finally, the CJWG voted to change the methodology for determining how the combined component scores are calculated (i.e., add the burdens and vulnerabilities calculations as opposed to multiplying the burdens and vulnerabilities) as shown in section 5.1.5. This Final Report was prepared by the State to provide the technical details of the DAC criteria.

[1] As identified pursuant to ECL § 75-0111.

2 CLIMATE LEADERSHIP AND COMMUNITY PROTECTION

2.1 RESPONSIBILITY FOR DEVELOPING CRITERIA TO IDENTIFY DACS

The Climate Act created the CJWG, which is comprised of 13 members, including environmental justice community representatives from New York City (NYC), Upstate urban communities, rural communities, and four state agencies, NYSDEC, NYSERDA, NYSDOH, and NYSDOL. The CJWG is responsible for establishing the criteria for identifying DACs. Meeting recordings and materials documenting this process may be found on the State's Climate Act website (climate.ny.gov).

To develop the criteria, including data, scoring approach, analysis, and maps, the CJWG was supported by a team of staff and subject matter experts from the State Agencies and Consultants (hereinafter the "Technical Team"). For certain topics or data, the Technical Team consulted or partnered with the New York State Department of State (NYSDOS), Office of Housing and Community Renewal (HCR), New York State Department of Transportation (NYSDOT), and other agencies. The Technical Team also consulted with experts in other state and federal agencies involved in California's Priority Populations definition (including CalEnviroScreen 4.0), Disadvantaged Vulnerable Communities Criteria, the federal Justice40 Initiative (including developers of the Climate and Economic Justice Screening Tool [CEJST]), and the federal Department of Energy's definition of DACs, the United States Environmental Protection Agency (EPA) Environmental Justice Screening and Mapping Tool, Washington State's Health Disparities Map, and national experts in environmental justice.

2.2 Climate Act Guidelines for Identifying DACs

As outlined in the Climate Act (ECL § 75-0111), DACs were identified:

"...based on geographic, public health, environmental hazard, and socioeconomic criteria, which shall include but are not limited to:

1. Areas burdened by cumulative environmental pollution and other hazards that can lead to negative public health effects;
2. Areas with concentrations of people that are of low income, high unemployment, highrent burden, low levels of home ownership, low levels of educational attainment, or members of groups that have historically experienced discrimination on the basis of race or ethnicity; and
3. Areas vulnerable to the impacts of climate change such as flooding, storm surges, and urban heat island effects."

The CJWG included all the above requirements outlined in the law in the final criteria for identifying DACs.

2.3 Applications of the DAC Criteria

The DAC criteria will be used for four statutory purposes:

- Co-pollutant reductions;
- Greenhouse gas emissions reductions;
- Regulatory impact statements; and
- Allocation of clean energy and energy efficiency investments.[2]

With respect to "allocation of investments," the DAC criteria will be used by State entities to direct clean energy and/or energy efficiency investments in a manner to ensure that DACs receive no less than 35% of benefits, with a goal of 40% of benefits.

[2] ECL § 75-0111(1)(b).

For purposes of clean energy and energy efficiency investments, in addition to the geographic criteria for identifying DACs, the CJWG also included low-income households located anywhere in the state that report annual total income below 60% of the state median income or are otherwise eligible for low-income programs, to ensure these residents remain a priority in the clean energy transition. The CJWG considered the 35% target and 40% goal to be minimums and encouraged State Agencies to invest more in DACs and low-income and climate-vulnerable households within and outside of designated DACs.

3 KEY OPERATING TERMS

Terms used in this document and the interpreted or defined meanings are summarized below. The Technical Team used definitions in the Climate Act when available and worked with State Agency staff to clarify these terms when needed.

Table 1. Definitions

	Definition
General Terms	
Census Tract	Statistical subdivisions of a county or equivalent entity updated by local participants prior to each decennial census. The U.S. Census Bureau delineates tracts to provide a stable set of geographic units for the presentation of statistical data.
Component	The criteria include seven Factors that are grouped into two sets, referred to as Components: (1) Environmental Burdens and Climate Change Risks; and (2) Population Characteristics and Vulnerabilities.
Criteria	The set of census tract-level indicators and rules to identify DACs, including the approach for using scores calculated from the data and indicators, and the process for using those scores to identify communities.
Designation	The process of identifying census tracts to be included in the set of DACs.
Factor	The 45 selected Indicators are grouped into seven sets, referred to as Factors, to bundle similar concepts for weighting purposes: (1) Potential Pollution Exposures; (2) Land Use associated with historical discrimination or disinvestment; (3) Potential Climate Change Risks; (4) Income; (5) Race/Ethnicity; (6) Health Impacts and Burdens; and (7) Housing, Energy, and Communications.
Indicator	A variable created from raw data to represent the presence, direction, or magnitude of a characteristic or circumstance of interest. In the DACs criteria, the indicators are designed to adjust for the size of the census tract (area or population) to enable relative scoring (comparisons) of census tracts.
List of DACs	Census tracts identified (designated) as DACs using the DACs criteria and scoring approach.
Scoring Approach	The methodology used for estimating the relative level of environmental burdens and climate change risks and population characteristics and health vulnerabilities associated with each census tract. These values are intended to represent the extent to which a census tract is disadvantaged relative to other tracts.
Environmental Burdens and Climate Change Risks (including exposures, pollutants, risks, threats, hazards, etc.)	
Burdens	Something that affects health or quality of life. An overburdened community is one with multiple stressors, including environmental and socio-economic. A community burden affects quality of life and a pollution burden has the potential to affect health. .

Environmental Effects	A type of stressor on the physical environment of a community. Could be an exposure or a burden.
Environmental Indicator	Indicators that represent the potential presence of pollutants in a community from sources known to be associated with its release. The indicator does not represent a direct exposure to pollutants. For some environmental indicators, there may be uncertainties in the dataset. For example, the location of the site or facility may not have been verified. Regardless of these uncertainties, there are other known environmental degradation and ecological effects that these indicators place on a community. These indicators also affect people by limiting their ability to make use of ecosystem resources (e.g., eating fish or swimming in local rivers or bays). Also, living in an environmentally degraded community can lead to stress, which may affect human health. In addition, the mere presence of facilities associated with significant potential pollution exposures can have impacts on a community, even if actual environmental degradation cannot be documented. Such sites or facilities can contribute to perceptions of a community being undesirable or even unsafe.
Exposures	Scientifically defined as known contact (via breathing, ingesting, or dermal absorption) with a chemical or biological agent. The term exposures is also used throughout the documentation in the context of potential pollution exposures, which is a set of indicators within the criteria.
Hazards	Something physical (chemical or biological) that has the potential for damage, harm, or adverse health effects. A hazard is distinct from proximity to potential pollution sources as the mere presence of a source is not a direct hazard without specific information. For example, a Superfund site may be a hazard if it is releasing chemicals and people have been exposed. A Superfund site that is cleaned up is not a hazard. Types of chemicals released, severity of the release, toxicity of the chemicals, and whether there is a completed exposure pathway for the public help to determine whether a hazard exists.
Pollution	Introduction of substance (chemical, noise, heat, or light) in the environment (air, water, or soil) that has the potential to cause harmful effects.
Risks	Chance of harmful effects to human health or safety from environmental exposures, burdens, or climate change. To understand the chance for potential risk, the magnitude and frequency of the exposure and outcome are necessary. For example, due to climate change, there is a risk of increased riverine flooding, which can be harmful to human health and safety.
Population Characteristics and Health Vulnerabilities	
Health Outcomes	For the purposes of this work, measures that may signify vulnerabilities in physical health that could be associated with increased risk from the impacts of climate change. Many health outcomes are multifactorial and may be impacted by personal behaviors, environmental, and genetic factors.
Indigenous Communities	For the purposes of this work, census tracts with greater than or equal to 5% of federally designated reservation territory or State-recognized Nation-owned land.
Low-Income Households	Households that have an annual income of less than or equal to 60% of State Median Income (SMI). For purposes of determining categorical eligibility for low-income energy programs, the State also deems participation in the Home Energy Assistance Program (HEAP) or Weatherization Assistance Program (WAP) as establishing a household to be low income.
Sensitive Populations	Groups experiencing poor health outcomes, low socioeconomic status, lack of access to resources, or other biological, physiological, or sociodemographic characteristics that increase susceptibility to environmental effects or risk from the impacts of climate change.

Socio-Demographic Characteristics	Socio-demographic characteristics are a combination of social and demographic factors that define people in a specific group or population. In general, socio-demographics include age, education, religion, employment, marital status, income levels, migration background, race, and ethnicity.
Vulnerability	Population characteristics that may be indicators of susceptibility to climate change, certain factors that impact community health, or pollution exposures. A population's vulnerability is influenced by socioeconomic factors and may also consider health outcomes. Examples of vulnerability include a high proportion of low-weight births, earning less than 80% of Area Median Income, limited English proficiency, or poor access to health insurance.

4 FINAL DISADVANTAGED COMMUNITY CRITERIA

4.1 Summary of Criteria

In determining the criteria to identify DACs, the CJWG identified 35% of census tracts in the state as DACs, meaning 1,736 of the state's 4,918 census tracts would be considered geographic DACs. The majority of these tracts are identified on the basis of 45 indicators (data) about "Environmental and Climate Change Burdens and Risks" and "Population Characteristics and Health Vulnerabilities" (Tables 2 and 3 below). The DAC list also includes 19 census tracts that are federally designated reservation territory or State-recognized Nation-owned Land.

The scoring approach is detailed in Section 5 and considers each census tract's relative burden, risk, vulnerability, or sensitivity based on these indicators. The percentile ranks of these indicators for each census tract was combined to produce a value that measures a census tract's score relative to the level of Environmental Burdens and Climate Change Risks, as well as Population Characteristics and Health Vulnerabilities relative to other tracts. Tracts with higher scores relative to (a) other tracts in the State or (b) their region (NYC or Rest of State) were identified as DACs. Census tracts must rank relatively high in terms of both "Environmental and Climate Change Burdens and Risks" and "Population Characteristics and Health Vulnerabilities" (or very high for one of these) to be identified as a DAC (Figure). Since the types and concentration of exposures, burdens, risks, historical discrimination, and vulnerabilities experienced by New Yorkers can vary considerably between NYC and communities in the rest of the state, the criteria also consider each census tracts' relative score compared with other tracts in two broad regions: NYC (five counties of NYC; 43% of population); and Rest of the State (57 counties; 57% of population).

The geographic DAC criteria will be used for purposes of ECL § 75-0111: co-pollutant reductions, GHG emissions reductions, regulatory impact statements, and the allocation of clean energy and energy efficiency investments. Just over 35% of the population and 35% of households in the state are included in the geographic DAC list.

Additionally, the DAC criteria includes **low-income households located anywhere in the state** for the purpose of investing or directing 35% to 40% of clean energy and energy efficiency programs, projects, or investments to DACs (ECL § 75-0117).For these purposes, low-income household is defined as a household reporting annual total income at or below 60% of State Median Income or is otherwise categorically eligible[3] for low-income programs (i.e., Home Energy Assistance Program).

Table 2. Environmental Burdens and Climate Change Risks: Indicators

Environmental Burdens and Climate Change Risk

[3] Categorical eligibility refers to New York State Energy programs allowing for automatic eligibility if a household is receiving one or more of various social benefits such as SNAP, Temporary Assistance, or SSI.

Potential Pollution Exposures	Land Use and Facilities Associated with Historical Discrimination or Disinvestment	Potential Climate Change Risks
Vehicle traffic density, diesel truck and bus traffic	Proximity to remediation sites	Extreme heat projections
Particulate matter ($PM_{2.5}$)	Proximity to regulated management plan sites	Flooding in coastal and tidally influenced areas (projected)
Benzene concentration	Proximity to major oil storage facilities	Flooding in inland areas (projected)
Wastewater discharge	Proximity to power generation facilities	Low vegetative cover
-	Proximity to active landfills	Agricultural land
-	Proximity to municipal waste combustors	Driving time to hospitals or urgent/critical care
-	Proximity to scrap metal processors	-
-	Industrial/manufacturing/mining land use	-
-	Housing vacancy rate	-

Table 3. Population Characteristics and Health Vulnerabilities: Indicators

Population Characteristics and Health Vulnerabilities			
Income	**Race and Ethnicity**	**Health Outcomes & Sensitivities**	**Housing Mobility & Communications**
Percent <80% Area Median Income	Percent Latino/a or Hispanic	Asthma emergency department visits	Percent renter-occupied homes
Percent <100% of Federal Poverty Line	Percent Black or African American	Chronic Obstructive Pulmonary Disease (COPD) emergency department visits	Housing cost burden (rental costs)
Percent Without Bachelor's Degree	Percent Asian	Heart attack (Myocardial Infarction) hospitalization	Energy poverty / cost Burden
Unemployment Rate	Percent Native American or Indigenous	Premature deaths	Manufactured homes
Percent Single-Parent Households	Limited English proficiency	Low birthweight	Homes built before 1960
-	Historical redlining score	Percent without health insurance	Percent without internet
-	-	Percent with disabilities	-
-	-	Percent adults age 65+	-

4.2 Characteristics of DACs

The criteria identify approximately 35% of census tracts in the State as geographic DACs. The communities covered by the geographic DAC criteria have higher average environmental burdens, climate change risks, and health and population vulnerabilities (Table 4).

Table 4. Comparison of Geographic DACs (35% of tracts) with non-DACs (65% of tracts)

	Indicator or Metric	Non DACs (65% of state)	Geographic DACs (35% of state)
Household Income	Household income <80% Area Median Income (relative to household size)	34%	63%
	Household income <100% of Federal Poverty Line (relative to household size)	9%	23%
Race and Ethnicity	Black or African American Population	10%	31%
	Hispanic and Latino Population	11%	34%
	Asian Population	10%	8%
	Native American, Pacific Islander or Indigenous Population	1%	2%
Component Scores	Environmental Burden and Climate Change Risk Score Percentile (Average)	41%	64%
	Population Characteristics and Health Vulnerabilities Score Percentile (Average)	33%	78%

Source for race, ethnicity, and income relative to Federal Poverty Line: U.S. Census American Community Survey data, 2015-2019. Source for 80% AMI data: U.S. Department of Housing and Urban Development, 2015. Source of relative indicator scores: Technical Team analysis.

Because of regional differences in sociodemographic characteristics, health, environmental burdens, and climate change risks, some regions of the state have relatively more or fewer DACs than others. Table 5 below shows that while on average 35% of the state is identified as geographic DACs, this distribution varies across regions of the state.

Table 5. Percentage of census tracts within each region designated a DAC

Region	Percent of Tracts Identified as DACs
New York City	44%
Long Island	14%
Mid-Hudson	42%
Western NY	34%
Finger Lakes	35%
Capital Region	21%
Central NY	35%
Southern Tier	22%
Mohawk Valley	26%
North Country	14%
Total	**35%**

Regions correspond with Regional Economic Development Council (REDC) regions. For a list of counties within each region, see https://regionalcouncils.ny.gov/. Chart is sorted from most to least populous regions.

Another way to understand the regional distribution is looking at the share of the state's population in each region and its share of DAC designated census tracts.

Table 6The five NYC counties are home to approximately 43% of the state's population, as well as 51% of the state's low-income population, and comprise about 55% of all census tracts designated as DACs. This means

NYC has proportionally more DACs relative to its population size. This is because, when considering all 45 indicators in the criteria, NYC census tracts scored relatively higher on the combined indicators. Similarly, Mid-Hudson communities hold a relatively greater proportional share of DAC tracts. Three regions – Western New York, Finger Lakes, and Central New York – have roughly proportional shares of the state's population and DAC census tracts. Long Island, Southern Tier, Mohawk Valley, and North Country have relatively fewer DAC census tracts compared to their share of population. This is because, when considering all 45 indicators in the criteria, their census tracts scored relatively lower on the combined indicators, compared to other census tracts in the Rest of the State (per above, combined scores are ranked relative to the "Rest of State" region, as well as statewide).

The map of DACs available on climate.ny.gov website allows viewers to see the indicator percentiles and each tract's percentile rank for "Environmental and Climate Change Burdens and Risks" and "Population Characteristics and Health Vulnerabilities" and the combined percentile rank, to understand why some tracts were identified as DACs and some were not.

Table 6. Share of each region's population, low-income population, and DAC census tracts

Region	Share of NY Total Population	Share of NY Low Income Population	Share of DAC Census Tracts
New York City	43%	51%	55%
Long Island	13%	7%	5%
Mid-Hudson	11%	9%	13%
Western New York	8%	8%	7%
Finger Lakes	7%	7%	6%
Capital Region	6%	5%	3%
Central New York	4%	4%	4%
Southern Tier	4%	4%	2%
Mohawk Valley	3%	3%	2%
North Country	2%	3%	1%
Total	**100%**	**100%**	**100%**

Chart is sorted from most to least populous regions.
*Percentages may not add up to 100% due to rounding

The scoring approach for the DAC criteria includes several methods to balance unique rural and urban burdens and vulnerabilities, including indicators for rural vulnerabilities (e.g., manufactured/mobile homes, distance to healthcare facilities) and the regional approach to scoring (i.e., separating "Rest of State" from "New York City" tracts and designating the top-scoring tracts in each).

4.3 Low-Income Households as DACs for the Purpose of Directing Clean Energy and Energy Efficiency Investments

In addition to the geographic DACs, the CJWG voted to include households that report total household income at or below 60% SMI into the criteria solely for the purpose of State Agencies investing or directing a percentage of clean energy and energy efficiency programs, projects, or investments to DACs, pursuant to ECL § 75-0117. This additional criterion will ensure investments in individual households outside of census tracts identified as geographic DACs making at or below 60% SMI are included in the accounting process.

The Technical Team estimates that slightly more than half (53%) of low-income households live in DACs, while slightly less than half (47%) live outside of DACs. Including low-income households located anywhere in the state into the criteria provides the opportunity for at least one million households (likely more) to be eligible as

DACs for the purpose of investing or directing clean energy programs, projects, or investments. Exact counts are difficult to determine at any point in time given the lag between the U.S. Census American Community Survey (ACS) and the present, and changes in low-income criteria (e.g., state median income) from year to year.

Like the regional share of geographic DACs, there are regional differences in the coverage of this individual household criteria. In general, the low-income household criterion allows relatively more households in rural areas to be included as DACs for State Agency clean energy and energy efficiency investment purposes. Table 7 below shows estimates of how many households may be included in the DAC criteria for the purposes of allocating investments, when low-income households are considered in addition to geographic DACs.

Table 7. Increase in number of households included in DAC criteria for purposes of allocating energy efficiency and clean energy investments, by Region

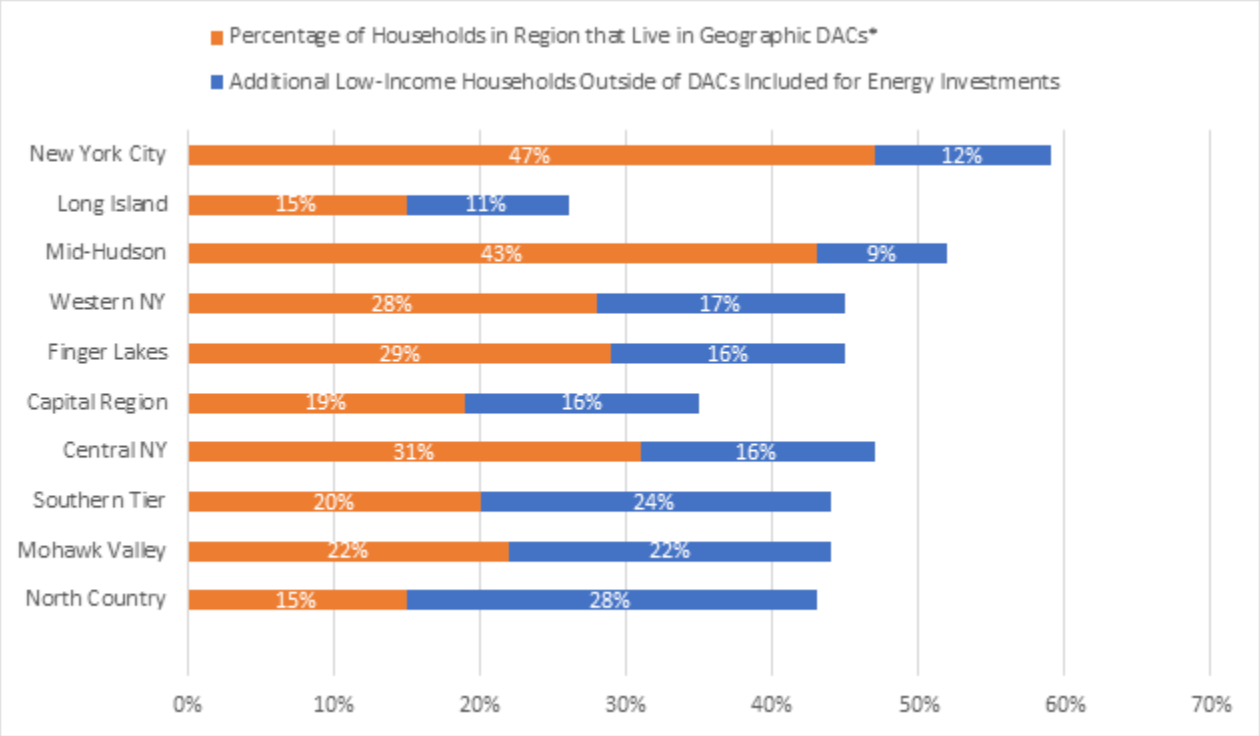


Chart is sorted from most to least populous REDC regions.

* The percentage of households that live in DACs within each region may vary slightly from the percentage of tracts identified as DACs within each region () because of slight variation in the population of tracts by region.

^^Source: American Community Survey (2015-2019) and Technical Team analysis. Estimated using 200% of Federal Poverty Line as a proxy for 60% SMI. Actual counts may be slightly higher since 60% of SMI is higher than 200% of the Federal Poverty Line.

The actual number of eligible and included households may vary depending on household incomes in and after 2020 and the structure of the program providing the eligible benefits. However, it is estimated that at least 50% of households could be included (35% within geographic DACs and at least 15% outside of geographic DACs) for certain clean energy and energy efficiency programs, projects, or investments in DACs.

5. DISADVANTAGED COMMUNITY SCORING AND DESIGNATION

5.1 Scoring and Designation Approach

This section describes the approach used to calculate relative scores for census tracts and how those scores are used to designate specific census tracts as DACs. The process for designating DACs involved the following steps:

1. **Identify the appropriate geographic unit of analysis:** Select the geographic unit of analysis based primarily on the availability, reliability, and stability of data for each unit and how State Agencies might manage actions or spending.
2. **Find and screen statewide data for inclusion:** Identify, consider, and evaluate indicators based on data coverage and granularity, data quality, data modeling, correlations with other indicators, and technical guidance from State Agencies.
3. **Obtain or calculate census tract level values for each tract for each indicator:** For each tract, calculate a percentile rank for each of the 45 selected indicators.
4. **Calculate Factor Scores:** Calculate seven factor scores from the weighted averages of sets of selected indicators.
5. **Calculate Component Scores:** Calculate two component scores from the weighted averages of sets of factor scores.
6. **Calculate Combined Scores:** Calculate a single combined score for each tract by adding the component scores together.
7. **Calculate Combined Score Percentile Ranks and Designate Tracts:** Calculate the values that are compared against each tract's scores to determine the DAC designation for each tract.
8. **Calculate Combined Score Percentile Ranks and Designate DACs**: Assign a combined score percentile rank, which is the highest value between its statewide combined score percentile rank and its regional combined score percentile rank.
9. **Indigenous Communities**: Include Indigenous Communities while respecting the sovereign, government-to-government relationship between Nations and the State.
10. **Low Population Areas**: Include low population areas based on their environmental burdens and climate change risk component score while excluding census tracts that have household counts or population counts that are too low for reliable data.

These steps for calculating tract scores and designating DACs are described in the following sections.

5.1.1 Geographic Unit of Analysis

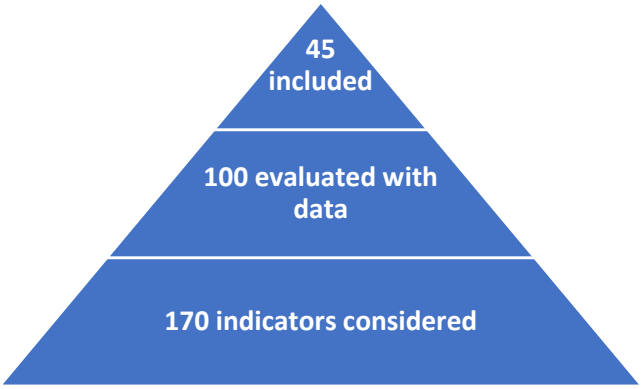
The CJWG and the Technical Team considered three different units of analysis: (1) census block group; (2) census tract; and (3) NYS aggregate area, and selected census tract as the level of analysis for the geographic component of the DAC criteria. There are 4,918 census tracts in the state, each with an average of about 3,989 people and 1,488 households. Census tracts are commonly used for neighborhood-level analysis andenvironmental justice and DAC screen tools.

Three primary considerations informed this decision: (1) the availability, reliability, and stability of data for each geographic unit; (2) how NYS Agencies might manage actions or decisions that affect how spending or benefits flow to a community; and (3) selecting an area that people might identify as a community. The Technical Team and CJWG also reviewed technical documentation from the EPA EJScreen, CalEnviroScreen, NYSDOH, and NYC Department of City Planning about trade-offs and limitations of using small census geographies like the block group and conferred with NYSDOH on data availability for key health outcomes. For additional detail on the decision to use census tract and the trade-offs and limitations associated with different units of analysis, please refer to Appendix Section 8.1.

5.1.2 Finding and Screening Statewide Data

The CJWG considered over 170 indicators, obtained and analyzed data for 100 indicators, and ultimately prioritized 45 indicators for inclusion in the DAC criteria (Figure 1). Section 6 describes the process for selecting indicators in more detail, including a preliminary rubric developed to prioritize indicators. This section describes the process of obtaining data, calculating indicators, and screening indicators analytically.

Figure 1. Indicator Counts by Process Step



After higher-priority indicators were identified, the Technical Team found data and assessed availability or feasibility of calculating at the census tract level. Where possible, the Technical Team found data sets that were published by the U.S. Census Bureau, EPA (EJScreen), National Air Toxics Assessment (NATA), the State, the U.S. Department of Energy, and other public sources with detailed technical documentation. Data sets that were publicly downloadable and available at the census tract level or lower for all of the state were prioritized for evaluation by the Technical Team.

After the Technical Team obtained or calculated data for all available indicators (about 100), they evaluated indicators based on how well they meet the criteria listed below:

- **Data coverage and granularity:** Are data available statewide at the geographic level needed? Because census tracts are the unit of analysis and geographic definition of a community, data need to be available for all census tracts in the state.
- **Data quality:** Are the data considered current and accurate, with limited measurement or sampling error? Measurement error can come from, for example, small or non-representative samples or models with general or non-localized assumptions.
- **Data accuracy:** Was the data modeled or measured primary data? How directly does the indicator represent the factor or concept that it is intended to represent? For example, is it a direct measure of the factor or concept or an indirect or proxy measure?
- **Correlations:** How essential and unique is the indicator to the DAC criteria? Does it contribute something essential and unique to the DAC criteria or is it highly correlated with other indicators? Where overlap between indicators exists, the indicator with the best data quality that most directly represents the factor or concept intended was selected.
- **Pre-existing indices:** Numerous indices of environmental, climate and health vulnerability were suggested. Each index is composed of several underlying indicators, which in some cases were already

included as stand-alone indicators. For indices that seemed valuable, the Technical Team searched for data representing the separate components, to avoid redundancy and overlap.[4]

- **Technical guidance:** What indicators do State Agencies familiar with the subject matter (e.g., health, environment, climate) and available data sources advise as the best way to represent or measure the subject or concept the CJWG is interested in?

Data evaluation included statistical diagnostics, such as completeness, skewness and outliers, and correlation with other indicators prioritized for inclusion by the CJWG. This helped identify potential indicators that were highly correlated with other indicators to streamline the variable list and eliminate some overlap. However, because many indicators of economic and health vulnerability, historical discrimination or disinvestment, and environmental burdens are highly correlated, some strong correlations remain in the final dataset.

Please see the Appendix in Section 8 for a list of considered indicators and some of the data limitations for each. As part of the annual review process, the CJWG may request or search for additional data or data updates.

5.1.3 Calculating Indicator Values per Census Tract

For each indicator, each census tract is assigned a "raw" value from the source dataset (e.g., vehicle traffic density per square meter; percent of land area zoned as industrial or manufacturing; percentage of housing units occupied by renters; average annual rate for asthma over five years). For some indicators, estimates for each census tract were readily available at the census tract level, but most required data cleaning, analysis, or transformations. For numerous environmental burden and climate change risk indicators, obtaining values per census required geographic information system (GIS) analysis to estimate normalized values per census tract from statewide data sources (e.g., NYSDEC databases or GIS Shapefiles) or climate models. For the following types of indicators, while underlying data was available to create indicators, the data was not calculated or estimated at the census tract level, and the Technical Team developed approaches for the data preparation of those indicators:

- NYSDEC provided classification and locational data for several indicators of environmental burdens,which needed custom calculations to represent at the census tract level;
- NYSDOH compiled and calculated health outcome data at the sub-county level for 1,274 aggregate areas, which are less granular than the census tract level, and the consultant team applied aggregate area values to census tracts;
- The Technical Team developed methods to estimate climate change risks and projections at the census tract level from existing climate models at different geographic levels;
- HCR compiled land use classification data at the tax parcel and property level and aggregated to census tract level; and
- Other indicators required other custom analytical approaches.

Section 6 details calculation methods for each indicator.

Every indicator's raw data is measured in different units and requires a common scale to combine and compare the data within and across indicators. For example, vehicle traffic density is measured as average annual daily traffic and is scaled to distance from a census block centroid, while Hispanic and Latino population is measured as a count of people, expressed as a percentage scaled by population. In some cases, data needed to be normalized to census tract land area or population (since tracts have varied sizes). Examples of normalizing indicators include

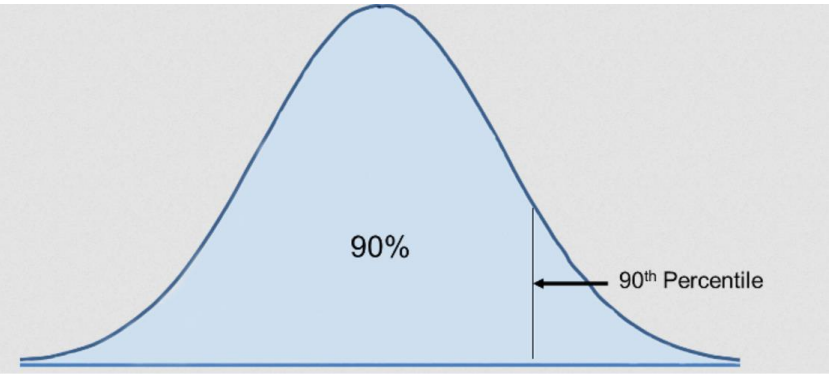
[4] One example are heat vulnerability indices. Several heat vulnerability indices consider land use factors like building density or intensity, vegetative cover or undeveloped land, as well as socioeconomic factors. Most socioeconomic factors were already suggested (or included) as separate indicators, and building density is highly correlated with several other indicators including traffic density and NATA modeled air toxics (e.g., PM 2.5, benzene), though the DAC criteria include areas with low vegetative cover to represent that element of heat vulnerability.

expressing count-based data as percent of populations, households, or tract area, or of an area-based metric (like square miles of agricultural land) as a percentage of tract area.

5.1.4 Calculating Indicator Percentile Ranks

After cleaning and normalizing the raw datasets, the Technical Team re-scaled the data by calculating a percentile rank ("percentile") for each census tract on each indicator. For data to be used in a single scoring system, it must be re-scaled to a common scale (like 0-100), so that the data can be added, averaged, or combined. The Technical Team considered several re-scaling approaches including statistical normalization (e.g., z-scores), min-max normalization, and percentile ranks. The Technical Team recommended percentile ranks because they are a straightforward way to represent the relative burdens or vulnerabilities between census tracts, smooth out potential measurement, sampling, or modeling error for some indicators,[5] and align with current environmental justice scoring approaches used by California, the EPA, the Washington State Health Disparities Map, and the Social Vulnerability Index of the Center for Disease Control and Agency for Toxic Substances and Disease Registry.

Figure 2. Illustrative example of a percentile interpretation, where an observation in the 90th percentile is greater than 90% of the other observations of the indicator.



The Technical Team also assessed how data sets represent missing data or "no impact" observations, e.g., if zeros in the data mean that the value was missing, not evaluated, or represents no disadvantage for the indicator. In some cases, raw data was missing from the original source because it was never collected or calculated.[6] In other cases, data was missing because the exposure, burden, or risk was not present, and to understand the relative exposure, burden, or risk between tracts, a "zero" value would better reflect the census tracts' statuses. For example, coastal flooding risk was only calculated for coastal tracts; to reflect their risk versus other tracts, data was modified reflect zero coastal flooding risk in non-coastal tracts. The Technical Team modified missing data to be included or excluded as zeros, as necessary.

[5] All three of these methods preserve and reflect the relative ranking (relative differences) between census tracts. Both z-scores and min-max normalization also preserve the relative magnitude of differences in values between census tracts (relative shape of the distribution), while percentile-based methods rank without preserving the magnitude of differences. In making the recommendation to use a percentile-based approach, the Technical Team considered how the many different types of data used in the DAC criteria were generated (e.g., based on models or samples vs. direct or complete measurement) and the potential for error (and published margins-of-error, if published). While for some indicators that are more precisely and comprehensively measured (e.g., land area zoned as industrial or manufacturing use), many are based on relatively small samples (e.g. Census ACS data samples about 2%-3% of the population each year), models, or are disaggregated from coarser-grained data. This could mean that the magnitude of some of the differences between tracts may be due to measurement or modeling area and, in some cases, we confirmed this by looking at margins-of-error of extreme (low or high) values, such that for some indicators the magnitude of differences between tracts may not represent significant or meaningful differences. A rank-based approach essentially smooths out the magnitude of some of the differences, which has pros and cons depending on the indicator.

[6] While the Technical Team prioritized data with statewide coverage, some valuable indicators have missing data for several reasons (e.g., for Historic Redlining that is based on 1930s home appraisals and neighborhood rankings, some areas, including more rural areas were not rated). Census tracts do not have an Indicator Value for one or more of the 45 Indicators. These blank Indicator Values are referred to as NULL Indicator Values.

To calculate the percentile rank for each of the 45 selected indicators the Technical Team ranked all non-zero data points of each indicator from smallest to largest. Observations (raw value data points) of zero were assigned a percentile rank of zero. Missing observations were not included in the percentile calculation. Percentile rank was then only calculated for those census tracts with a score above zero. The first non-zero percentile value is dependent on the number of non-zero observations. The first value is 100 divided by the number of non-zero observations. Each subsequent rank is a multiple of that number. In the event of a tie, every observation in the tie was assigned the maximum percentile rank. Census tracts with fewer than 100 people that are not designated as Indigenous Communities are excluded from the calculation of Indicator Percentile Ranks (see "Low Population Areas" for additional details).

The example below includes 10 non-zero observations. Therefore, the lowest ranked observation would be assigned the 10th percentile. But, in this case, the lowest ranked observation is tied with one other observation. The Technical Team assigned the maximum rank for observations that were tied. The maximum rank is multiplied by the count of non-zero values for the final percentile score.

Table 8. Example percentile calculation with random data. For illustrative purposes only.

Tract	Raw Observations in Ascending Order	Rank of Non-Zero Values, or Max of Rank if Tie	Count of Non-Zero values	Final Percentile Score
0001	0	0	10	0
0002	14.6	2	10	20
0003	14.6	2	10	20
0004	24.6	3	10	30
0005	35.6	4	10	40
0006	37.8	5	10	50
0007	37.9	8	10	80
0008	37.9	8	10	80
0009	37.9	8	10	80
0010	38	9	10	90
0011	50.2	10	10	100
0012	NA	NA	10	NA

The percentile approach to scoring created a relative ranking of census tracts on each indicator. This allowed all 45 indicators to be on the same scale so indicators could be added or averaged together in a scoring approach. The scoring approach did not specify a threshold or cut-off to say that one community faced a high burden or risk, and one did not. While it may be possible to find scientific documentation of what air pollution exposure level may cause a threat to human health, it is difficult (and subjective) to say what climate projections, land use, sociodemographic, or health outcomes may make a community "disadvantaged."

Percentile rank calculations were performed for all selected indicators, as well as considered indicators screened and analyzed for potential inclusion.

5.1.5 Calculate Factor Scores

The 45 selected Indicators are grouped into seven sets, referred to as **Factors**, to bundle similar concepts for weighting purposes. Factors include:

Environmental Burdens and Climate Risks:

(1) Potential Pollution Exposures
(2) Land Use Associated with Historical Discrimination or Disinvestment

(3) Potential Climate Change Risks

Population Characteristics and Health Vulnerabilities:

(4) Income, Education, and Employment
(5) Race, Ethnicity, and Language
(6) Health Outcomes and Sensitivities
(7) Housing, Energy, and Communications

The 45 Indicators are split into these seven Factors to calculate seven **Factor Scores**. Each Factor Score for a given census tract is calculated as a weighted average of **Indicator Percentile Ranks** for that Factor's associated Indicators. To calculate this weighted average, each Indicator associated with the Factor is assigned an **Indicator Weight**, which is multiplied by the Indicator's Percentile Rank. Dividing this product by the sum of the Indicator Weights yields the Factor Score for that Factor. If a tract has a missing value for an indicator, the value for that indicator and the weight for that indicator are excluded from the calculation of Factor Scores. For details about the indicators comprising each factor see Section 6 Indicators in Criteria.

For example, the "Potential Pollution Exposures" factor comprises five indicators: Vehicle Traffic Density; Diesel Truck and Bus Traffic; Fine Particulate Matter ($PM_{2.5}$); Benzene Concentration; and Proximity to Wastewater Discharge. Each of these indicators are weighted equally (i.e., they all have a weight of 1 within the factor). To illustrate the method used to calculate the Potential Pollution Exposures Factor Score, the bullets below represent this process for a hypothetical census tract:

- Assume the five Indicator Scores for this Factor are 25, 40, 90, 80, and 70 for this tract;
- Each of this tract's Indicator Percentile Ranks for the five Indicators in this Factor are multiplied by their Indicator Weights: (25*1) = 25, (40*1) = 40, (90*1) = 90, (80*1) = 80, and (70*1) = 70;
- These products are summed: 25 + 40 + 90 + 80 + 70 = 305;
- The weights for the five indicators are summed: 1 + 1 + 1 + 1 + 1 = 5;
- The weighted average is the sum of the weighted Indicator Percentile Ranks divided by the sum of Indicator Weights: 305 / 5 = 61;
- This yields a Potential Pollution Exposures Factor Score of 61 for this hypothetical tract.

A summary of factor scores by census tract are available on https://data.ny.gov/ as part of the Disadvantaged Community documentation.

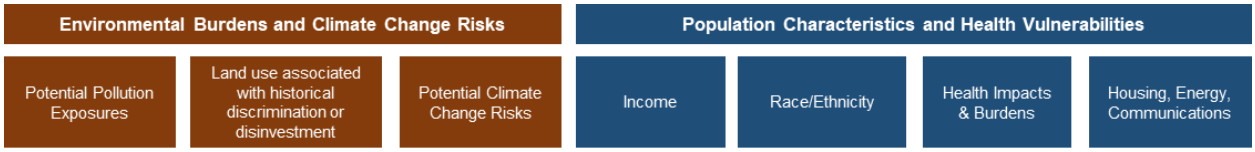
5.1.6 Calculate Component Scores

The seven Factors are grouped into the following two sets referred to as Components:

(1) Environmental Burdens and Climate Change Risks
(2) Population Characteristics and Vulnerabilities

The "Environmental Burdens and Climate Change Risks" Component comprises three of the seven factors, and the "Population Characteristics and Vulnerabilities" Component comprises the remaining four factors. Tracts are assigned a **Component Score** using a similar process to that used for the Factor Score. To calculate the Component Score for a tract, the seven Factors are split into two Components – Environmental Burdens and Climate Change Risks and Population Characteristics and Health Vulnerabilities. The figure below shows how the seven Factors are combined into two overarching Components: (1) Environmental Burdens and Climate Change Risks; and (2) Population Characteristics and Health Vulnerabilities.

Figure 3. Two Components and their Associated Factors



Each Component Score for a given census tract is calculated as a weighted average of **Factor Scores** for that Component's associated Factors. To calculate this weighted average, each Factor associated with the Component is assigned a **Factor Weight**, which is multiplied by the Factor's Factor Score. Dividing this product by the sum of the Factor Weights yields the Component Score for that Component.

The two figures below show how the two components are calculated from Factor Scores and Factor Weights. Figure 4 shows how the Environmental Burdens and Climate Change Risks Component is calculated by multiplying each of its three constituent Factor Scores by their weights and dividing the sum of those products by the sum of the Factor Weights.

Figure 4. Calculating the Environmental Burdens and Climate Change Risks Component

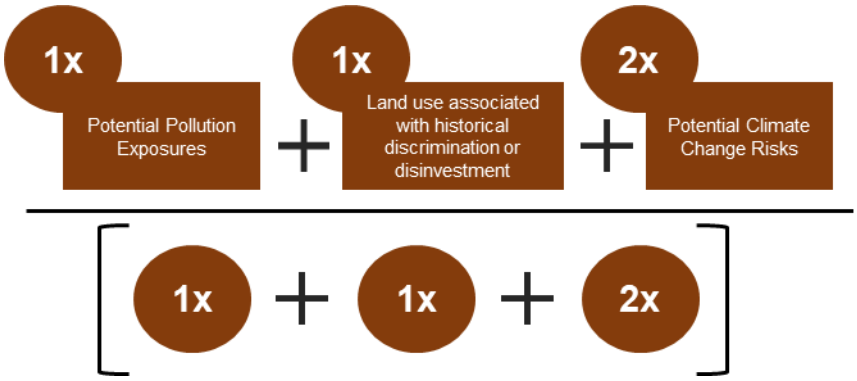
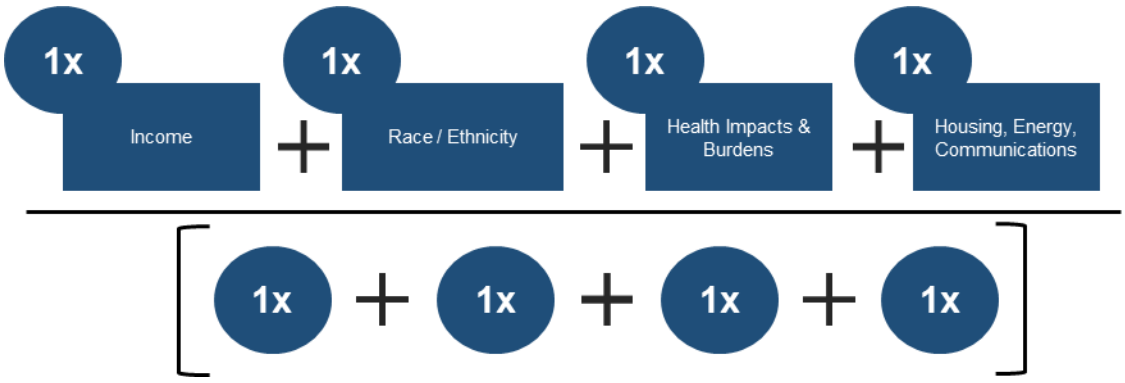


Figure 5 shows how the Population Characteristics and Health Vulnerabilities Component is calculated by multiplying each of its four constituent Factor Scores by their weights and dividing the sum of those products by the sum of the Factor Weights.

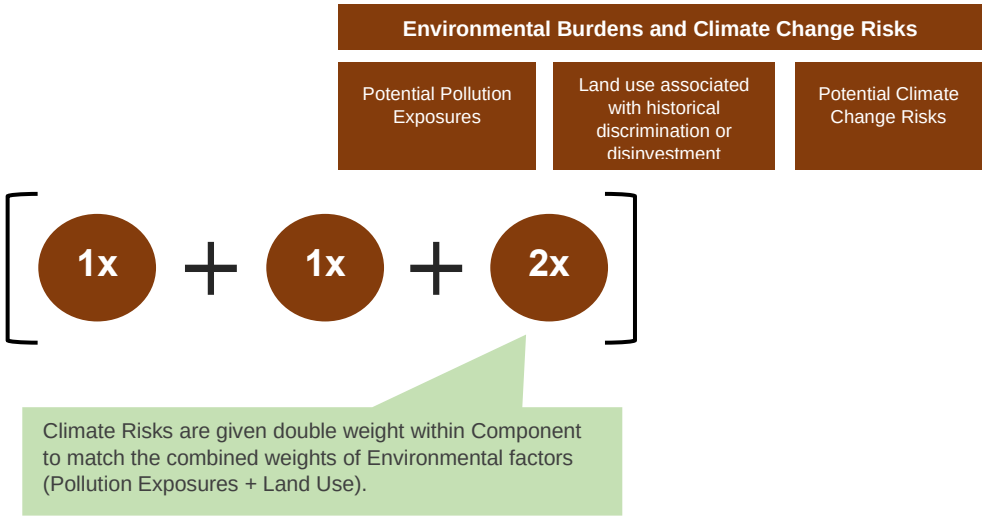
Figure 5. Calculating the Population Characteristics and Health Vulnerabilities Component



The method for calculating Component Scores and Factor Scores takes a balanced approach to weighting. Within the Environmental Burdens and Climate Change component, the CJWG decided that Environmental considerations ("Exposures" and "Land Use and Facilities"), together, should have the same weight as "Potential

Climate Change Risks." To achieve this, since there are two Environmental factors, the "Potential Climate Change Risks" factor is given a weight of two (2x) to match the combined weight of the two environmental factors (1x + 1x) (6).

Figure 6. Climate Justice Working Group Meeting Slide Excerpt Documenting Double Weight for "Potential Climate Risks" Factor



It is worth noting that because there are fewer "Environmental Exposures" indicators (4) than "Land Use and Facilities Indicators" (9), each environmental exposure indicator has slightly more than double the weight of environmental burdens. This approach aligns with CalEnviroScreen, California's environmental justice mapping tool, and was recommended by NYSDEC because the Environmental Exposures represent potential contact with estimated pollutant concentrations and risk could be quantitatively assessed. Whereas the Land Use and Facilities Indicators represent proximity to potential pollution where the amount and type of pollutant released is less certain and risk is not possible to calculate.

The calculation of the "Environmental Burdens and Climate Change Risks" Component for a hypothetical tract illustrates the approach. This Component comprises three Factors: Potential Pollution Exposures; Land Use Associated with Historical Discrimination or Disinvestment; and Potential Climate Change Risks. The Potential Climate Change Risks Factor is given double weight and the other two Factors are both given a weight of one. Figure 4 above depicts the calculation for this Component score. To illustrate the method used to calculate the Environmental Burdens and Climate Change Risks Component score, the bullets below represent this process for a hypothetical census tract:

- Assume that the three Factor Scores for this Component are 60, 80, and 75 for this tract.
- Each of this tract's Factor Scores for the three Factors are multiplied by their Factor Weights: (60*1) = 60, (80*1) = 80, (75*2) = 150.
- These products are summed: 60 + 80 + 150 = 290.
- The weights for the three Factors are summed: 1 + 1 + 2 = 4.
- The sum of the weighted Factor Scores is then divided by the sum of Factor Weights: 290 / 4 = 72.5.
- This yields an Environmental Burdens and Climate Change Risks Component Score of 72.5 for this hypothetical tract.

5.1.7 Calculate Combined Score per Tract

The final **Combined Score** for a census tract is calculated by adding its two **Component Scores** together. For example, a Combined Score for a hypothetical census tract with a Component Score of 60 for "Environmental Burdens and Climate Change Risks" and 40 for "Population Characteristics and Health Vulnerabilities" would have a Combined Score of 100 (i.e., 60 + 40). This process is depicted in Figure 7.

Figure 7. Calculating a Combined Score by Adding the Two Component Scores

This approach of adding Environmental/Climate Burdens with Population/Health Vulnerabilities was reviewed by the CJWG based on public comments questioning the draft criteria's approach of multiplying component scores. The CJWG voted to use addition rather than multiplication because it aligned better with areas that the CJWG ground-truthed (i.e., commenting that a specific area should or should not be identified as a DAC, based on knowledge of a specific area or based off the percentile scoring of indicators compared to all other census tracts).

The 138 census tracts in the state with low household or population counts (fewer than 300 households or fewer than 500 people) are considered Low Population Areas and have only NULL[7] **Indicator Values** and NULL **Factor Scores** for the "Population Characteristics and Vulnerabilities" Component. The resulting NULL "Population Characteristics and Vulnerabilities" Component Score for these Low Population Area also yields a NULL Combined Score for these tracts.

5.1.8 Calculate Combined Score Percentile Ranks and Designate DACs

Each tract is then assigned a **Combined Score Percentile Rank**. A tract's Percentile Score Rank is defined as the highest value between its Statewide Combined Score Percentile Rank and its Regional Combined Score Percentile Rank, which both range from 0 to 100. A tract's Statewide Combined Score Percentile Rank is calculated by ranking its Combined Score in relation to all other census tracts in New York State with Non-NULL Combined Scores. A tract's Regional Combined Score Percentile Rank is calculated by ranking its Combined Score only in relation to other Non-NULL Combined Scores of census tracts in its region – either NYC or Rest-of-State (all other tracts).

Tracts considered to be Low Population Areas are assigned a **Burden Score Percentile Rank**, defined as the highest value between its Statewide Burden Percentile Rank and Regional Burden Percentile Rank. These Burden Percentile Ranks are calculated by comparing a Low Population Area tract's "Environmental Burden and Climate Change" Component Score with that Component Score for all other tracts across the state (for the Statewide Burden Percentile Rank) or in the tract's region – either NYC or Rest of State (for the Regional Burden Percentile Rank).

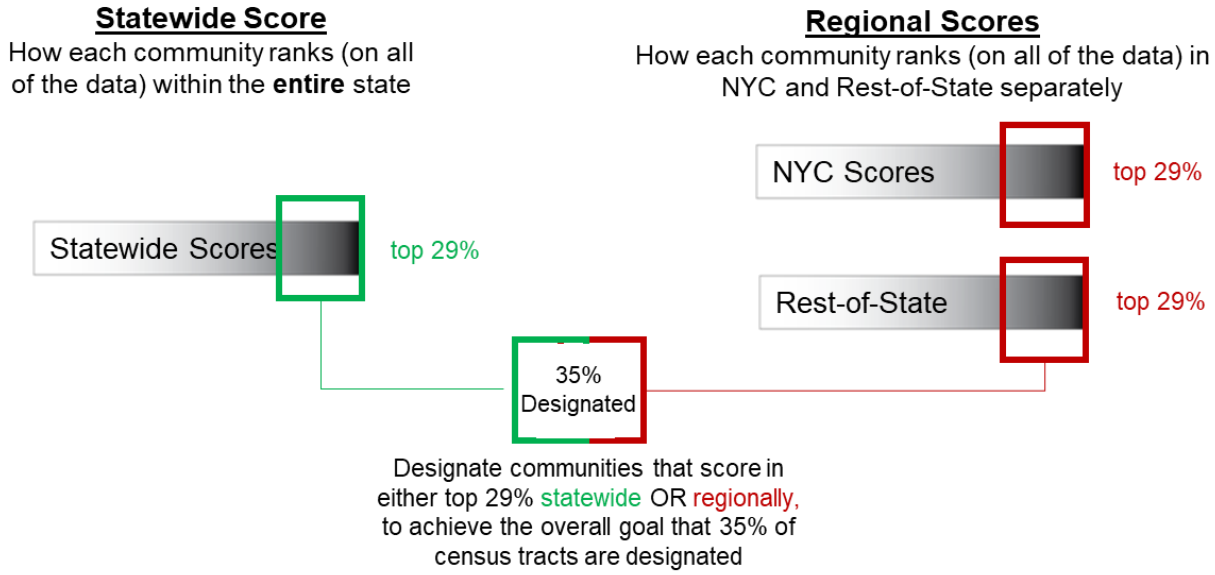
The last step in the process is to determine whether each tract's combined score falls above the threshold for inclusion in the 35% of census tracts to be designated as Geographic DACs. To achieve the CJWG's decision of designating 35% of the state as DACs and ensure an equitable share of tracts are identified as DACs, this approach designates a tract as a DAC if its combined score ranks above the **DAC designation threshold** either statewide or regionally.

- Combined Score is within top X% of the statewide distribution
- Combined Score is within top X% of its regional distribution (NYC or Rest-of-State)

The **DAC designation threshold** is the percentile above which census tracts are included in the DAC list. A tract is designated as a DAC if its Combined Score Percentile Rank is greater than 71.7. A Combined Score Percentile Rank of 71.7 or greater would indicate that the census tract's Combined Score is within the top 28.9% of all tracts across the state or within the tract's region. A tract considered to be Low Population are designated as a DAC if its Burden Score Percentile Rank is greater than 71.7. A Burden Score Percentile Rank of 71.7 or greater would indicate that the Low Population Area census tract's Burden Score is within the top 28.9% of all tracts across the state or within the tract's region. Figure 8 below summarizes this process.

[7] NULL entries describe an entry with no data.

Figure 8. DAC Designation Using Statewide and Regional Score Thresholds



To designate 35% of tracts as DACs, the DAC designation threshold must be set slightly higher, to 28.9%. This threshold is set at 28.9% instead of 35% to adjust for two factors:

- Census tracts can be designated as DACs based on the rank of their Combined Score relative to both statewide and regional sets of tracts. Selecting the top 35% of Combined Scores for both statewide and regional distributions would designate more than 35% of tracts as DACs.
- The tracts identified as Indigenous Communities and those identified as Low Population Areas, are subject to special rules for DAC designation. As the designation of these communities is not based on their Combined Scores, these tracts add to the number of DACs without changing the Combined Score ranks of other census tracts. This would result in designating more than 35% of the state as DACs without adjusting the threshold for other tracts.

The CJWG determined that Indigenous Communities should be represented in the DAC criteria. NYSDEC identified Indigenous Nation census tracts (19 total) that are included as part of the 35% of census tracts identified for the criteria.

Figure 9 and Figure 10 show how the percentile ranks of the two component scores relate to the DAC designation. Both figures plot the statewide percentile ranks for simplicity, though in practice both statewide and regional percentile ranks were used in designating DACs.[8] The dark dots in both figures show DACs that have either (a) high-to-moderate scores on both components, or (b) a high score on one component, and moderate score on the other component. The light dots in the top left of each figure show tracts with high Vulnerability scores but low-to-moderate Burdens scores that were excluded. Low-income households in these tracts may still be included for investment purposes. The light dots in the bottom-right of both figures show tracts with high environmental or climate burdens (e.g., proximity to exposure or hazard; flooding risk) with low population and health vulnerabilities.

Figure 9. Scatterplot of Statewide Percentile Ranks of NYC Census Tracts

[8] Since NYC tracts typically have higher scores on both components, the percentile ranks of draft DAC tracts in NYC are typically higher than in the rest of the state. For tracts in the rest of the state, their regional Combined Score percentile ranks (calculated using only tracts outside of NYC) allowed more tracts to score in the top percentiles regionally.

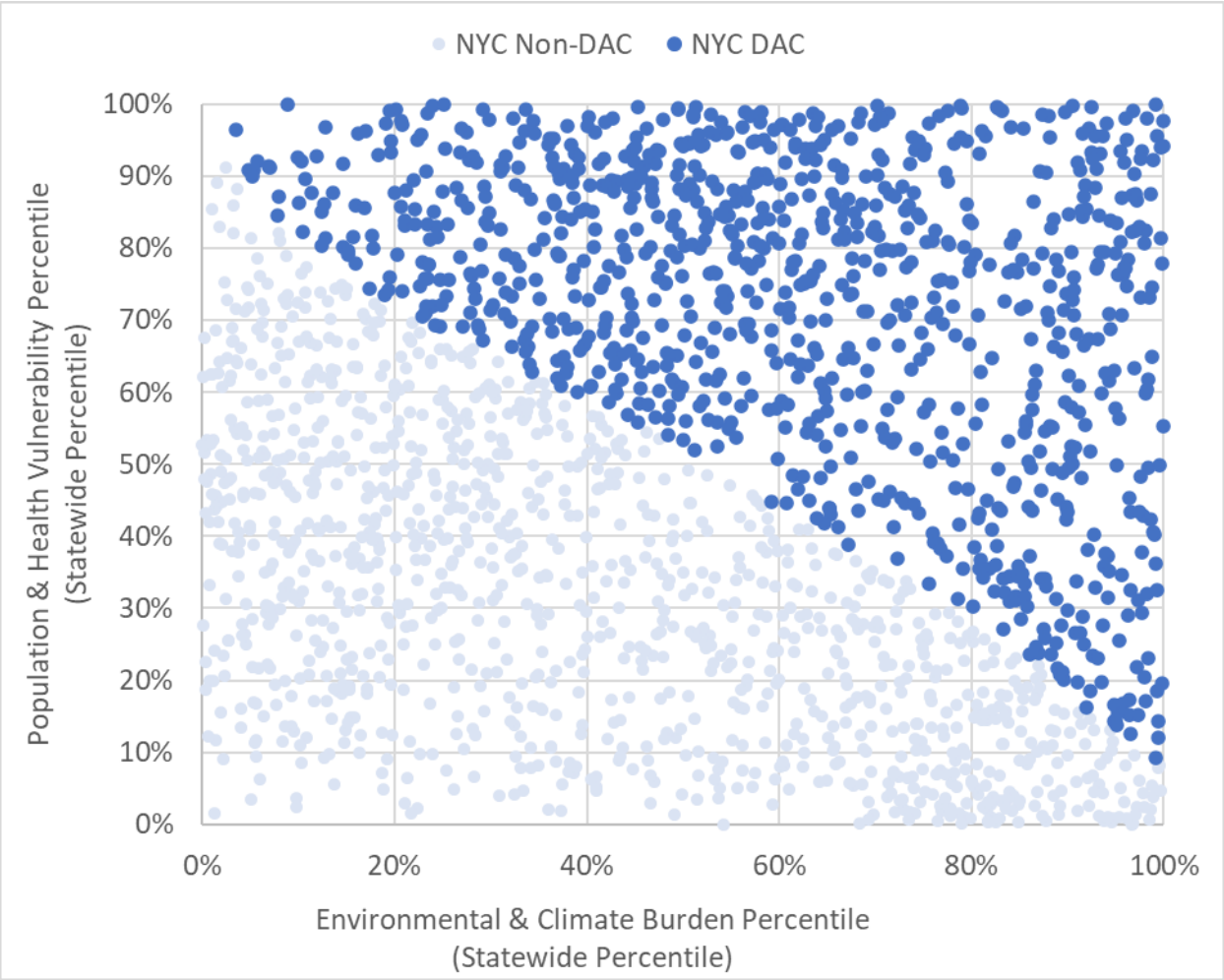
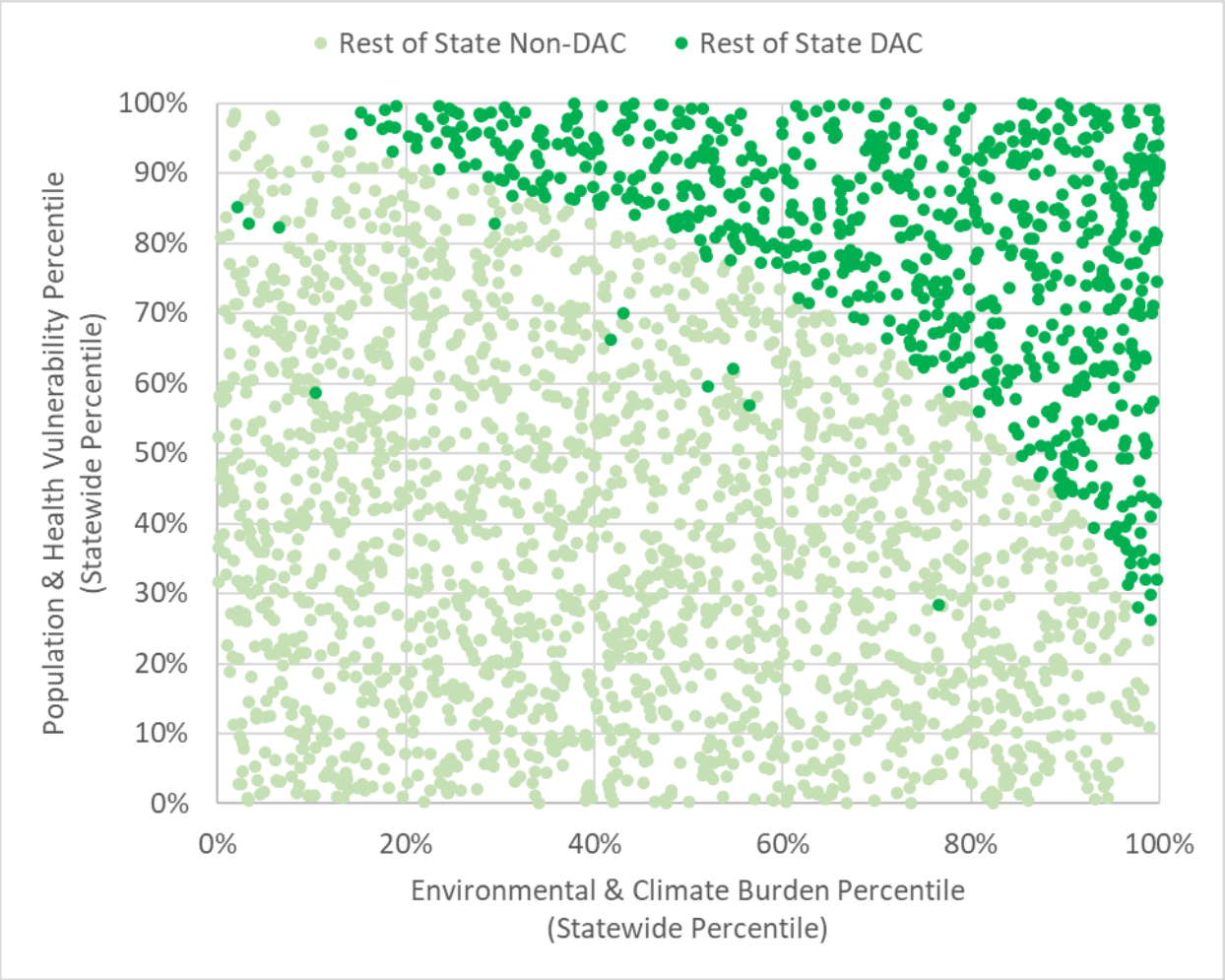


Figure 10. Scatterplot of Statewide Percentile Ranks of Rest-of-State census tracts



5.1.9 Indigenous Communities

Indigenous Peoples live throughout the area now called New York State and have a deep history with these lands that span millennia. In the state there are nine state- or federally recognized Indigenous Nation governments: Cayuga Nation; Oneida Indian Nation; Onondaga Nation; Saint Regis Mohawk Tribe; Seneca Nation of Indians; Shinnecock Indian Nation; Tonawanda Seneca Nation; Tuscarora Nation; and Unkechaug Indian Nation. The United States formally recognizes all but the Unkechaug Nation. The State recognizes all nine Nations. These nine sovereign governments administer their Nation territories and govern their own citizens. Indigenous Nation citizens may live on-territory or anywhere across the state, and many citizens live off-territory in urban centers. It is important that we consider the unique histories of racism and discrimination experienced by Indigenous People, particularly in a colonial context. Indigenous Peoples are included in the Disadvantaged Community Criteria according to two methods:

- As individual members of census tracts: As counted by the U.S. Census Bureau in counts of American Indian and Alaska Native population (a selected indicator)
- As citizens of sovereign Nations or residents of Nation-owned territory: If the Nation-owned territory (either sovereign territory or owned) exceeds 5% of the area of a census tract, the census tract will be designated a DAC regardless of criteria scores
- By including Indigenous People according to the two aforementioned methods, the CJWG have established a baseline for inclusion while continuing to respect the government-to-government relationship between the State and the various Indigenous Nations. The Nations can continue to determine their involvement in the Disadvantaged Community Criteria, including whether Nation territories should

continue to be included within the designation of DACs. NYSDEC and NYSERDA will continue to offer the opportunity to consult government-to-government on these topics with the Nations' leadership.

5.1.10 Low Population Areas

There are 138 census tracts that have household counts or population counts that are too low for reliable sociodemographic data (fewer than 100 households or fewer than 300 people) from the U.S. Census or NYSDOH (either the data has large margins-of-error, or it is not available for a small geographic area). Therefore, socio-demographic or health data are not used, and "Population Characteristics and Vulnerabilities" scores are not calculated. However, these tracts still have "Environmental Burden and Climate Change" Component Scores. If their population is at least 100 people, these tracts are scored based on Environmental/Climate Burdens alone if their Burdens score fall about the **DAC designation threshold** for NYC or Rest-of-State, similar to the approach for designating DACs from Combined Scores for other tracts. There are 81 tracts in the state with fewer than 100 people, and these tracts are not considered at any stage in the scoring process. The only exceptions are tracts considered to be Indigenous Communities, which are included in the scoring process even if they have fewer than 100 people.

6. INDICATORS IN FINAL CRITERIA

6.1 Indicator Prioritization and Selection

As part of the process of developing criteria to identify DACs, CJWG members and the Technical Team identified many potential indicators to include. The process of identifying and prioritizing indicators included the following steps:

- Review other state and federal screening tools, environmental and climate data, including CalEnviroScreen 3.0 and 4.0, EPA EJScreen, Justice40 Interim Guidance, FEMA Natural Hazard Risk Index, CDC Social Vulnerability Index, and other emerging state definitions.
- Brainstorm and refine list with CJWG (initial brainstorm plus continual additions throughout the process).
- State Agency subject matter expert guidance.
- Developing initial scoring rubric to prioritize indicators as described previously.
- Obtaining data and calculating indicators for prioritized indicators as previously described.
- Data review and statistical screening for all indicators for which data was obtained or calculated as previously. described

The CJWG and the Technical Team identified more than 170 indicators for consideration. Many were not (a) supported by sufficient, high-quality, granular statewide data, or (b) as applicable to the goals or applications of the DACs' criteria in the Climate Act as other indicators. The Technical Team advised that having fewer (but stronger) indicators in the criteria is anticipated to lead to a stronger, simpler, and more transparent criteria. With fewer indicators, each indicator will make a larger, more meaningful contribution to the DAC identification. As the list grows, each indicator affects the criteria to a lesser extent. Further, additional indicators may be highly correlated with each other and thereby do not add additional nuance to the criteria.

Prior to obtaining data and calculating indicators, the Technical Team ran indicators proposed by the CJWG through a prioritization rubric. The rubric identifies indicators and associated metrics and data that are better candidates for including in the DACs criteria, namely:

- Relevance and applicability to Climate Act objectives, statutory language, and purposes (applications) of the DAC criteria.
- Data availability, sufficiency, and quality.
- That the data is most representative of concepts of what make up DACs according to the CJWG and Technical Team.

The Technical Team used the rubric for an initial assessment of proposed DAC indicators to identify high-priority indicators. Rubric scores can also help explain why some indicators were prioritized over similar indicators (e.g., because of scores for data availability and quality).

After the Technical Team found and calculated census tract level estimates and percentile ranks, they performed further data review and statistical analysis to identify potential data gaps or quality concerns and look at correlations between the indicators.

In addition, the CJWG weighed some indicators more highly than others. The following indicators were assigned 2X the weight: Percent Latino/a or Hispanic; Percent Black or African American; Percent <100% of the Federal Poverty Line; and Percent <80% Area Median Income.

The following pages contain details on each of the 45 indicators included in the criteria, including:

- Metric Definition
- Data Source
- Calculation Method
- Potential Limitations

6.2 Environmental Burden and Climate Change Risk Indicators

The Technical Team generated all indicator data using the calculation methods described below to generate "raw" value, and then calculated the percentile rank of each indicator using the approach described in Section 5.

Potential Pollution Exposures

Particulate Matter (2.5) Air Concentration

Metric Definition: Annual average $PM_{2.5}$ (particulate matter 2.5 microns or less in diameter) modeled ambient air concentrations.
Data Source: U.S. EPA EJSCREEN (Office of Air and Radiation) downloaded from file created May 2019 for 2016 estimated concentrations (USEPA, 2016).
Calculation Method: EJSCREEN uses USEPA modeled air concentrations at the census tract level and uses a combination of air quality monitoring data and modeling with a Bayesian space-time downscaling fusion model to estimate ambient, annual average $PM_{2.5}$ concentrations (Diao, 2019). They assign all block groups in the census tract the same data value. We again rolled up the block group-level EJSCREEN data to the tract-level by using the tract level value that had been assigned to every block group.
Potential Limitations and Future Improvements: $PM_{2.5}$ modeled concentrations are based on 2016 estimates and may not reflect current conditions. U.S. EPA's National Emissions Inventory (NEI) was used in the modeling along with air monitoring results. There are always uncertainties in developing an NEI Emissions inventory development for structural fires and wildfires is less certain than development of emissions information for certain industry sectors where reporting of emissions information is required. Estimates in areas with greater density of air monitoring, such as New York City, may have less modeling uncertainty. The estimates are annual averages. Short-term averaging times may have been used in studies where health effects have been documented.

Benzene Air Concentration

Metric Definition: Benzene modeled ambient air concentrations.

Data Source: U.S. EPA's NATA benzene concentrations for data year 2014.
Calculation Method: U.S. EPA developed outdoor air concentration estimates using a complex computer program called a dispersion model that merges the emissions data with meteorological data, such as wind speed and wind direction, to estimate pollutant concentrations in ambient air. This modeling accounted for emissions from large industrial facilities, such as power plants and manufacturing facilities; smaller facilities, such as dry cleaners and gas stations; mobile sources such as motor vehicles, trains, planes/airports, ports and boats; and farming and construction equipment. U.S. EPA also accounted for pollution due to residential wood burning, wildfires, agricultural burning, and structural fires. Benzene concentrations in micrograms per cubic meter at the census-tract level were obtained.
Potential Limitations and Future Improvements: Represents historical emissions from 2014 and may not accurately reflect current conditions. Emissions inventory was developed from surrogate information such as population density and not an actual count of vehicles or gasoline-powered equipment. U.S. EPA cautions against using census-tract level comparisons to draw conclusions about individual exposures. Monitored benzene concentrations in the state show a decrease in ambient benzene levels since 2014.

Proximity to Wastewater Discharge

Metric Definition: Toxicity-weighted stream concentrations at stream segments within 500 meters, divided by distance in kilometers (km).
Data Source: U.S. EPA EJScreen Toxic Release Inventory (TRI) Risk Screening Environmental Indicators (RSEI) downloaded from file created May 2019 for the data year of 2017 (USEPA, 2020).
Calculation Method: The EJScreen indicator considers proximity from the stream reaches within 500 meters of a census block centroid, divided by distance in meters, presented as the population-weighted average of blocks in each block group (USEPA, 2019). Stream discharge monitoring reports from the U.S. EPA's Toxic Release Inventory (TRI) were used in a U.S. EPA model called Risk Screening Environmental Indicators (RSEI). The model incorporates chemical toxicity and fate and transport to estimate concentrations of pollutants in downstream water bodies and derive a toxicity-weighted concentration. In this way it accounts for proximity and toxicity-weighted stream concentrations of pollutants with potential human health effects. We rolled up the block group-level EJSCREEN data to the tract-level by taking a weighted average of the block group observations, weighted by the proportion of the census tract population that was in the block group.
Potential Limitations and Future Improvements: The RSEI model calculates results for direct water releases from facilities to streams and waterbodies. The results may not represent actual population exposures. Individuals would need to come into contact with the contaminated water either by dermal exposure through swimming, inhalation of volatized pollutants, drinking contaminated water, or by eating contaminated fish. The modeled results reflect estimates from 2017 reports and may not capture emerging contaminants reported to TRI after the modeled year.

Diesel Trucks and Bus Traffic

Metric Definition: This indicator quantifies the annual average daily count of diesel trucks and buses on the roads within each census tract. Following the assumption used by other researchers that assumes most vehicles within classes 4 - 13 are diesel powered (Levy, 2003; NYSDEC, 2019) using the Federal Highway Administration's vehicle category classification (USDOT, 2013).
Data Source: NYS Roadway Inventory System, NYSDOT Traffic Viewer, Annual Average Daily Traffic, (Federal Highway Administration classes 4-13) (NYSDOT, 2019).
Calculation Method: Calculations were based on the NYSDOT (2019) annual average daily diesel vehicle counts by road segment, including designated truck routes and truck access highways for which higher diesel vehicle counts are expected. For this analysis, the count of diesel vehicles was summed by road segment. A buffer of 150-meters was generated around each census tract (U.S. Census, 2019) to estimate the extent of diesel emissions. The buffers were overlaid with the NYSDOT roads and counts of diesel vehicles was length-weighted to the portion of road segments located within the buffer. Within each tract's buffer, the total of the length-weighted annual average daily diesel vehicle count was divided by the total length of all roads in the buffer. Tracts without roads within the 150-meter buffer were recorded as zero truck traffic. Tracts comprised of only

open water were removed, including for cases where the tracts 150-meter buffer extended on land and included roads outside the tract boundary.

Potential Limitations and Future Improvements:

Traffic count is one variable influencing the magnitude of emissions. A notable limitation with this method is the assumption of a uniform distribution within the buffer zone of vehicle class and emissions. Other variables including vehicle mix, vehicle speed, traffic flow, meteorology, built environment, and vegetation that may cause considerable variation in exposure to emissions around roads. In addition, the traffic counts are limited by data collected at only NYSDOT site locations and assumptions are being made that they represent high traffic areas for trucks and buses. This indicator may overlook areas with a higher density of vehicles and emissions ("hotspots") such as bus stops or highways with slow moving vehicles, especially in larger census tracts. A diluted count may result when the buffer is applied to an entire census tract boundary and includes other roads within the census tract that reduce the impact of the of the higher density of vehicles and emissions.

Further refinements of this first approximation of traffic density could include:

1) Vehicle speed to better estimate traffic density (vehicle-km hr./buffer zone).
2) "Hotspots" could be defined as an area of less than 100 meters of a bus stop or highways with a high propensity for slow-moving traffic.
3) The influence of other variables (vehicle mix, meteorology, built environment, and vegetation) to compare census tracts on a more granular level.
4) Peak hour traffic data to analyze traffic congestion within buffer zones.

Vehicle Traffic Density

Metric Definition: Count of vehicles (average annual daily traffic) on major roads.

Data Source: 2019 version of U.S. EPA EJScreen, calculated from 2017 USDOT traffic data (USEPA, 2020).

Calculation Method: Measures of traffic proximity in EJSCREEN are based on average annual daily traffic estimates in the Highway Performance Monitoring System (HPMS) dataset in the U.S. Department of Transportation's (USDOT) National Transportation Atlas Database. The HPMS highway data are maintained by states and compiled by USDOT. Vehicle counts (average annual daily traffic) at major roads (i.e., all interstate, principal arterials, and other collector highways in the national highway system) within 500 meters of a census block centroid, are divided by distance of the census block centroid in meters to the road. The results are population-weighted average to the census block group level (weighted by 2015-2019 American Community Survey population). Since block group-level EJSCREEN data were obtained, they were aggregated to the tract-level by taking a weighted average of the block group observations, weighted by the proportion of the census tract population that was in the block group.

Potential Limitations and Future Improvements:

Five-hundred meters may be too great of a distance and could be including neighborhoods less likely to be considered disproportionately burdened by traffic-related air pollution. This large distance could minimize localized effects and may make it difficult to identify disproportionate impacts in densely populated urban areas. A U.S. Centers for Disease Control and Prevention study based on the 2010 Census found that Latinos, non-whites, foreign born, and people who speak a language other than English at home were most likely to live within 150 meters of a major highway (Boehmer et al., 2013). Future analyses should consider distances of 100 to 300 meters and more local data. Refined dispersion modeling at the individual census block level, while adjusting for roadway length and wind direction, was more strongly correlated with modeled roadway pollutant concentrations (Rowangould et al., 2019).

Land Use and Facility Siting Associated with Historical Discrimination or Disinvestment

Industrial, Mining, and Manufacturing Land Use

Metric Definition: Percent of census tract land area designated as a manufacturing tax lot (for New York City only) or parcel (for the rest of the State) in tax records. The following land uses are included:

- Light, heavy, and high-tech manufacturing and industrial processing
- Warehouses and factories
- Mining and quarrying

- Lumber yards
- Petroleum production and gas or oil fuel storage (not for a utility)
- Water storage

The designation generally excludes vacant land and junk yards in industrial areas

Data Source: New York City Department of City Planning Primary Land Use Tax Lot Output (PLUTO) lots (for New York City only) and New York State Homes and Community Renewal (HCR) tax parcels (for the rest of the State) [2021].
New York City data: https://data.cityofnewyork.us/City-Government/Primary-Land-Use-Tax-Lot-Output-PLUTO-/64uk-42ks
NYS HCR data received through direct communication and available from HCR upon request. NYS property class documentation: https://www.tax.ny.gov/research/property/assess/manuals/prclas.htm#industrial
Statewide building footprint data: https://gisservices.its.ny.gov/arcgis/rest/services/
NYS statewide parcel map data: http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1300
Calculation Method: We classified each tax class into categories of industrial and manufacturing or non-industrial and manufacturing. We totaled the area of the tax lots (for New York City only) or parcels (for the rest of the State) that were manufacturing land and divided by the total land area of the census tract.
Potential Limitations and Future Improvements: This data relies on the accuracy of tax records and their granular categories. Because different sources were used for the State and NYC, which may have slightly different classification practices, there may be a systematic difference in results across the state. However, because the DAC scoring approach considers relative combined scores for NYC tracts separately from Rest of State tracts, this potential inconsistency is addressed through final scoring. Multiple CJWG members expressed that not all industrial areas (public utility, manufacturing, or transportation) represent exposures, risks, or threats. NYSDEC noted that while zoning is an important tool municipalities use, there does not need to be an implication that all industrial zones are bad and that this needed further discussion. Additionally, one stakeholder noted that this indicator should capture abandoned manufacturing zones and brownfields. This indicator does not capture historical land uses, which could indicate the lingering contamination of, for example, old fuel tanks. Other environmental exposure or burden indicators (e.g., proximity to remediation sides, groundwater threats, or chemical waste sites) may capture some of the burden from historical uses.

In the future an alternative metric could look at citations for regulated facilities, which would indicate the non-compliance of facilities to regulations. This alternative metric is dependent on the breadth of the citation reporting system and would not include the overall industrial land concept of discrimination in siting and land value. Looking instead at major truck routes to represent the increased truck traffic in manufacturing areas was suggested during a CJWG meeting.

Agricultural Land Use

Metric Definition: Percent of census tract land area that is covered by agricultural land, classified as hay/pasture or cultivated crop area.
Data Source: United States Geological Survey National Land Cover Database (NLCD) [2016] (30m raster geospatial data)
Calculation Method: NLCD land cover categories and class values were reclassified as either agricultural or non-agricultural land covers. The reclassified NLCD land cover dataset (a raster GIS file) was overlaid with census tracts to find the percent of each tract comprised of each class. Within each census tract the percent agricultural land was calculated as the sum of both agricultural land classes divided by the sum of all non-water land classes (i.e., excluded open water). Agricultural land cover classes include hay/pasture and cultivated crop area.
Potential Limitations: The indicator's reclassification of land area does not consider open water in either the numerator or denominator. Therefore, this indicator does not include any potential protective effect that open water may have on heat vulnerability.
Future Improvements: Monitor if/when new NLCD data is available.

Proximity to Remediation Sites

Metric Definition: Count of remediation sites within a census tract.

Data Source: NYSDEC remediation sites as of July 26, 2010 (NYSDEC, 2010).
Calculation Method: Number of remediation sites (both point and area locations) within each census tract. Census tracts without a point location or with less than 1% of tract area covered by remediation site area, are given a value of zero. Descriptions of NYSDEC's Brownfield Cleanup and State's Superfund Programs available online (NYSDEC 2022).
Potential Limitations and Future Improvements: Proximity alone may not represent any actual risk or even exposure. The metric does not consider pollutant dispersion or offsite migration, toxicity of contaminants, and magnitude of emissions. An evaluation on the types of contaminants remediated or the amounts remediated was not done.

Proximity to Risk Management Plan Sites

Metric Definition: Count of facilities within 5 km, divided by distance (USEPA 2019).
Data Source: U.S. EPA EJScreen's Risk Management Plan (RMP) (USEPA 2022) sites data, downloaded from file created May 2019 (USEPA 2020).
Calculation Method: USEPA calculated the count of facilities within a 5 km distance from a census block centroid. A proximity score was calculated which gave more weight to nearer distances by using an inversion formula (1/distance). If there was no facility within 5 km of a block centroid, 1/distance was used, with distance in km to the single nearest facility. A weighted average of the block observations, weighted by the proportion of the block group population that was in the block, was done to calculate the average proximity to a site of a block group. The block group-level results were aggregated to the census tract-level by weighting the proportion of the census tract population that was in the block group to provide an average proximity to a site within a census tract.
Potential Limitations and Future Improvements: Proximity alone may not represent any actual health risk or even exposure. This metric does not include smaller facilities with regulated substances below the established threshold. RMP facilities are diverse in their size, structure activities and the type of regulated substance.

Proximity to Major Oil Storage Facilities

Metric Definition: Percentage of census land area within 500 meters of at least one Major Oil Storage Facilities (MOSF), including storage terminals at airports, military sites, and manufacturing facilities.
Data Source: NYSDEC major oil storage facilities as of July 20, 2010 (NYSDEC, 2010).
Calculation Method: A 500-meter buffer around each MOSF was created and the buffer areas were overlaid on census tracts. Using the intersection areas as areas of influence, the percent of influence for each census tract was developed. Overlapping areas of influence were combined which could provide some tracts with an area of influence greater than 100%. Tracts without intersection areas were assigned 0%.
Potential Limitations and Future Improvements: Proximity alone may not represent any actual risk or even exposure. An evaluation of the type of petroleum product stored was not done. Some stored products are more volatile and result in larger air releases.

Proximity to Power Generation Facilities

Metric Definition: Percentage of tract land area within 1 mile of at least one power generation facility burning fossil fuel, including peaker units.
Data Source: Fossil-fuel power generation facilities from NYSDEC's 2019 emissions inventory (NYSDEC 2019) and USEPA's Emissions & Generation Resource Integrated Database (eGRID) for facilities operating within 1-mile of the State's borders (USEPA 2019).
Calculation Method: A 1-mile buffer around each power plant was created and the buffer areas were overlaid on census tracts. Using the intersection areas as areas of influence, the percent of influence for each census tract was developed. Overlapping areas of influence were combined which could provide some tracts with an area of influence greater than 100%. Tracts without intersection areas were assigned 0%.
Potential Limitations and Future Improvements: Proximity alone may not represent any actual risk or even exposure. The approach applied does not consider dispersion and toxicity of pollutants, and magnitude of emissions. The approach does not evaluate size of the facility. Metric is based on counts of overlap between tract and a buffer around facility, but not degree of overlap.

Proximity to Active Landfills

Metric Definition: Percent overlap of an active landfill's estimated area of influence (500 meters) within a census tract.
Data Source: Locations of active landfills operating in 2021, obtained from NYSDEC's Division of Materials Management (NYSDEC 2021).
Calculation Method: A 500-meter buffer for a single point location in the landfill was created and the buffer areas were overlaid on census tracts. Using the intersection areas as areas of influence, the percent of influence for each census tract was developed (i.e., percent census tract falling within the buffer). Overlapping areas of influence were combined which could provide some tracts with an area of influence greater than 100%. Tracts without intersection areas were assigned 0%.
Potential Limitations and Future Improvements: Proximity alone may not represent any actual risk or even exposure. The approach applied does not consider dispersion and toxicity of pollutants, and magnitude of emissions. Metric is based on counts of overlap between tract and a buffer around facility, but not degree of overlap.

Proximity to Municipal Waste Combustors

Metric Definition: Percent of tract area within a 500-meter buffer of a municipal waste combustor
Data Source: Locations of active municipal waste combustors operating in 2021, obtained from NYSDEC's Division of Materials Management (NYSDEC 2021).
Calculation Method: A 500-meter buffer for municipal waste combustor was created and the buffer areas were overlaid on census tracts. Using the intersection areas as areas of influence, the percent of influence for each census tract was developed (i.e., percent census tract falling within the buffer). Tracts without intersection areas were assigned 0%.
Potential Limitations and Future Improvements: Proximity alone may not represent any actual risk or even exposure. The approach applied does not consider dispersion and toxicity of pollutants, and magnitude of emissions. Metric is based on counts of overlap between tract and a buffer around facility.

Proximity to Scrap Metal Processing and Vehicle Dismantlers

Metric Definition: Frequency of scrap metal processing and vehicle dismantler facilities in a census tract.
Data Source: Locations of active vehicle dismantlers and scrap metal processing facilities operating in 2021, obtained from NYSDEC's Division of Materials Management (NYSDEC 2021).
Calculation Method: The number of facilities within each census tract were counted to obtain the frequency by census tract.
Potential Limitations and Future Improvements: Proximity alone may not represent any actual risk or even exposure. The approach applied does not consider dispersion and toxicity of pollutants, and magnitude of emissions. The metric does not consider the size of the facility, or the volume of vehicles or scrap metal processed on an annual basis.

Housing Vacancy Rates

Metric Definition: Vacant housing units as a percentage of housing units
Data Source: 2019 American Community Survey (ACS) 5-year table DP04 – Selected Housing Characteristics
Calculation Method: Percentage data available from the census at the census tract level was used.
Potential Limitations and Future Improvements: Stakeholders requested migration indicators for inclusion in the DAC criteria, but we were unable to know the starting place of a migrant population with available data. Meaningful migration data is available at the county-level. A migration indicator would be a more direct measure of community investment over time than housing vacancy rates. The time frame would have to be considered to represent either short-term changes in population or historical fluctuation. While possible to capture net migration by census tract, it is difficult to assess whether a net decrease or increase is a disadvantage. In-migration could represent disadvantage due to overcrowding, threats from other areas (with higher climate risk) or displacement of low-income residents from rising rents in low-property value areas. Out-migration could represent disadvantage due to community disinvestment, threats of climate risks, and population displacement.

Climate Change Risks

Flooding in coastal and tidally influenced areas (projected)

Metric Definition: Percentage of census tracts within an "Extreme" or "High" flood risk area for coastal and tidally influenced areas including Lake Ontario, Hudson River, and ocean shorelines.

Data Source: NYSDOS Coastal Risk Areas

Calculation Method: NYSDOS models risk for three coastal sub-regions in the State: Lake Ontario, Hudson River, and ocean shoreline. Topology was examined for overlapping areas for each data set separately and corrected (sliver areas). Data sets were examined for geometric errors and corrected as needed using "Repair Geometry" function in ArcGIS Pro (v. 2.6.0).

The goal was to estimate flood risk for a "middle of the road" climate scenario. For the coastal areas, these include flood or erosion risk from shallow water flooding areas, areas prone to erosion, sea level rise (SLR), FEMA flood zones (i.e., floodplains - V zone, 100, and 500 year), and Category 3 Hurricane from Sea Lake and Overland Surges from Hurricanes - projected out to year 2100. Of note, a 3-foot SLR (above 2000-2004 average) was incorporated into this analysis (above MHHW [1983-2001 NOAA datum]).

Three levels of risks were identified: (1) Extreme – FEMA V, shallow water flooding areas + 3-feet of SLR and areas prone to erosion, (2) High – 100-year floodplain zone + 3' SLR, and (3) Moderate – 500-year floodplain zone + 3' SLR + Category 3 SLOSH storm. To approximate a moderate risk, we included only the Extreme and High flood risk areas in this analysis and grouped them into a single risk category to simplify for inclusion into an overall flood/erosion index. Census tracts were processed using the NYSDOS Risk Area model, and the percent of the tract falling in the different risk zones was calculated to attain a relative ranking across census tracts.

Potential Limitations and Future Improvements: Rates of future sea level rise will largely depend on global levels of GHG emissions. Pursuant to the Community Risk and Resiliency Act, NYSDEC will update its sea level rise projections at least every five years, with the next update due in 2022. The NYSDOS Coastal Risk Areas should be updated to reflect NYSDEC's updated sea level rise projections. Future indicator updates could use updated coastal risk models to include updated SLR projections expected in 2022.

Flooding in Inland Areas (Projected)

Metric Definition: The data represent the projected annual return interval (RI) of flow relative to the historic 100-yr event flows for modeling units (Habitat Response Units - HRU) as projected under a climate change (CC) scenario at a future point in time. For example, a value of 70 means the 100-yr event is projected to occur every 70 years under that CC scenario/time period.

Data Source: FEMA Digital Flood Insurance Rate Map (DFIRM) (https://msc.fema.gov/portal/home; released on May 06, 2021), National Center for Atmospheric Research (NCAR), USEPA's Climate Impacts Risk Assessment (CIRA).

Calculation Method: Analysis of inland flood risk utilized data generated by Wobus et al. 2017[9], which projected annual return intervals (RI) of flows relative to the historic 100-year event flows for modeling units (Habitat Response Units - HRU) as projected under a climate change scenario at a future point in time. For example, a value of 70 means the current 100-year event is projected to occur every 70 years under that climate change scenario and time period. The Technical Team overlaid the current FEMA 100-yr floodplain GIS layer with census tracts and the Wobus projections of future RIs. Projected RI values were area-weighted where floodplains and tracts crossed into adjacent HRUs. The final RI values were then converted into the annual probability of exceeding the 100-year event in the year 2090 (e.g., 1 = 1% chance of exceeding the 100-year event in any year). The exceedance probability was area-weighted by the proportion of the census tract falling within the floodplain to provide a relative flood risk index for the census tract.

Note: Census tracts that do not include a mapped FEMA floodplain were not included in this analysis. Additional note: The Technical Team used a "middle of the road" emission scenario (Representative Concentration Pathway - RCP 4.5) for year 2090 to align with a 3-foot SLR scenario as noted in the ClimAid 2014 Update (Horton et al., 2014).

Potential Limitations and Future Improvements: There is an inherent unreliability in flood projections predicated on historic 100-year events. Because these models are based on historic data, they are unable to

[9] Wobus, C., Gutmann, E., Jones, R., Rissing, M., Mizukami, N., Lorie, M., Mahoney, H., Wood, A. W., Mills, D., and Martinich, J.: Climate change impacts on flood risk and asset damages within mapped 100-year floodplains of the contiguous United States, Nat. Hazards Earth Syst. Sci., 17, 2199–2211, https://doi.org/10.5194/nhess-17-2199-2017, 2017.

reliably capture the future conditions created by climate change. Even when modified to account for a climate change scenario, there is a degree of variation that is dependent on global levels of GHG emissions. These models will improve as our capacity to capture the actual conditions of climate change improves.

Projected Days Above 90 Degrees Fahrenheit

Metric Definition: Average annual number of days with maximum temperature above 90°F and 95°F for both baseline (1980-2010) and future (2036-2065) time periods.
Data Source: https://www.nyclimatescience.org/highlights/data_products
Calculation Method: Overlaid the census tracts with average annual number of days with maximum temperature above 90°F and 95°F for baseline and future scenarios. The baseline used 30 years of data centered on 1995 (years 1980-2010) and future used 30 years centered on 2050 (years 2036-2065).
Both climate data sets were obtained from the Climate Data Grapher developed by the Northeast Regional Climate Center and available on the New York Climate Change Science Clearinghouse (NYCCSC) (https://www.nyclimatescience.org/highlights/data_products) as tabular data (in "*.csv" files) and summarized by USGS basins (at the Hydrologic Unit Code 8 [HUC8] level). Note that when using the Climate Data Grapher Interactive Chart, the values displayed for selected parameters do not match the tabular data being downloaded from the same site. This analysis was based on the downloaded datasets.
Baseline data were derived from the gridded data at a resolution of 1/16th degree described by Livneh (2015) and based on observed weather station data and statistically interpolated using the parameter-elevation regressions on independent slopes (PRISM) model (Daly et al., 1994). The projected data are derived from an average of 32 General Circulation Model (GCM) projections from the Climate Model Intercomparison Project Phase 5 (CMIP5) and downscaled to a spatial resolution of 1/16 degree (approximately 6 km x 6 km) using the Localized Constructed Analog (LOCA) method (Pierce et al., 2014). In order to link census tracts to climate model results at the HUC8 level, we obtained USGS HUC8 GIS layer released in 2017 (USGS, 2017), which matched to the HUC8 identifiers and basin names listed by the NYCCSC datasets. We overlaid the census tracts and USGS HUC8 GIS layers and calculated their intersection areas and area weights (percent) relative to the tract areas. We used area weights to estimate weighted mean numbers of days with maximum temperature above 90°F and 95°F for each time period. For census tracts without model results – due to a location outside the model domain or with missing model results - we assigned a value of "-999."
Potential Limitations and Future Improvements: Ideally this metric would be heat waves or consecutive hot days above 90 degrees, but this was not possible in the time frame of the evaluation. The NYSDOH does not have a reliable indicator for heat-related illnesses or deaths due to infrequency impacting data reliability. However, heat vulnerability is a factor of other variables such as projected 90degree days, vehicle traffic (road) density, and vegetative cover. Sociodemographic and health indicators (including race, ethnicity, Percent >65 and Percent with disabilities), which are included in the selected indicators, are also characteristics/conditions that are associated with heat vulnerability.

Low Vegetative Cover

Metric Definition: Percent of census tract land area that is highly developed or not covered by vegetation.
Data Source: USGS National Land Cover Database (NLCD) [2016]
Calculation Method: NLCD land cover categories and class values were reclassified as either vegetated or non-vegetated land covers. The re-classified NLCD land cover dataset was then overlaid with census tracts to find the percent of each tract comprised of each class. Within each census tract, the percent of vegetated land was calculated as the sum of all vegetated land classes divided by the sum of all non-water land classes (i.e., excluded open water). Land cover classes were distinguished as follows:

- Low- or non-vegetated
    - Developed, Medium Intensity
    - Developed, High Intensity
    - Barren Land
    - Other unclassified areas
- Vegetated
    - Developed, Open Space
    - Developed, Low Intensity

- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Herbaceous
- Hay/Pasture
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands

Potential Limitations and Future Improvements: The indicator's reclassification of land area does not consider open water in either the numerator or denominator. Therefore, this indicator does not include any potential protective effect that open water may have on heat vulnerability.
The Technical Team will monitor and advise the CJWG if/when new NLCD data is available.

Driving Time to Hospitals or Urgent/Critical Care

Metric Definition: Average travel times (minutes) and distances (miles) between New York Census Tracts and the 3 nearest healthcare facility within the State or neighboring states.
Data Source: State hospitals: "Locations of Article 28, Article 36, and Article 40 health care facilities and programs from the Health Facilities Information System (HFIS)." Updated weekly. Vector Digital Data Set (Point). NYSDOH. Accessed: https://health.data.ny.gov/Health/Health-Facility-Map/875v-tpc8 (6/11/2021) Federal hospitals: "Hospitals". Publication date: 6/30/2020. Vector Digital Data Set (Point). Homeland Infrastructure Foundation-Level Data (HIFLD) database. (https://gii.dhs.gov/HIFLD) Credits: Oak Ridge National Laboratory (ORNL); National Geospatial-Intelligence Agency (NGA) Homeland Security Infrastructure Program (HSIP) Team. Accessed: https://hifld-geoplatform.opendata.arcgis.com/datasets/hospitals/explore?location=43.179486%2C-73.245981%2C7.00 (6/11/2021).
Calculation Method: Healthcare facilities were obtained from a Federal (406 facilities) and State (1,452 facilities) sources (see input data sources). Tract points were the origins and hospitals were the destinations. Locations were snapped to the network up to a distance of 7.5 km. For each tract, the three closest hospitals by travel time were found and time (minutes) and distances (miles) were reported. Road travel time and distances were calculated using an Origin-Destination Cost Matrix using ESRI ArcMap Network Analyst and Tele Atlas StreetMap Premium v. 7.2.
Potential Limitations and Future Improvements: Area level measures of driving distance may not capture individual burden of time spent in transit. Since we do not have complete information for facilities in other states, the burden may not be captured accurately in areas that border other states. Different health conditions may have specialized health care needs that may not be captured by the general health care facilities captured by this measure.

6.3 Population Characteristics and Health Vulnerabilities

The Technical Team generated all indicator data below using the calculation methods described below to generate "raw" value, and then calculated the percentile rank of each indicator using the approach described in Section 5.

FACTOR #1: INCOME, EDUCATION AND EMPLOYMENT

Population Earning Less Than 80% of Area Median Income

Metric Definition: Percentage of census tract population earning less than 80% of Area Median Income
Data Source: Housing and Urban Development (HUD) 2020 (from 2011-2015 ACS Census data and the Income Limits for Metropolitan Areas and for Non-Metropolitan Counties)
Calculation Method: HUD develops median family incomes for each metropolitan area, parts of some metropolitan areas, and each nonmetropolitan county. HUD normalizes the data 'by family size and for areas with

unusually high or low family income or housing-cost-to-income relationships.' As per HUD, 'The data necessary to determine an LMI [AMI] percentage for an area is not published in the publicly available ACS data tables. Therefore, the Bureau of Census matches family size, income, and the income limits in a special tabulation to produce the estimates.' We used HUD's final data set of percentage of population earning less than 80% AMI by census tract.
Potential Limitations and Future Improvements: This indicator does not capture extreme poverty, and so the indicator based on federal poverty level is included as well.

Poverty Rate (Below 100% Federal Poverty Level)

Metric Definition: Percentage of the population earning income less than 100% of the federal poverty level.
Data Source: 2019 American Community Survey (ACS) 5-year table C17002 – Ratio of Income to Poverty Level in the Past 12 Months.
Calculation Method: We summed the estimates of the population in each tract that were under 50% of the federal poverty level and between 50 and 99% of the federal poverty level. Then we divided that total by the total population in the census tract.
Potential Limitations and Future Improvements: This census table does not normalize the poverty threshold by any area or geography, which, while indicated above, is beneficial in the sense that we can capture burdens of higher poverty, with this metric we are not able to capture families who are relatively burdened in higher income areas. This federal poverty level metric combined with an area median income metric captures both absolute and relative burden. In the future, the Technical Team may be able to develop one indicator that represents overall income burden.

Single Parent Households

Metric Definition: Percentage of households with single parent and children below age 18.
Data Source: 2019 American Community Survey 5-year Table – DP02.
Calculation Method: We totaled the number of households with a single male head of household with their own children under the age of 18 and the number of households with a single female head of household with their own children under the age of 18. We divided this total by the overall number of households in the census tract.
Potential Limitations and Future Improvements: None discussed.

Adults Without a Bachelor's Degree

Metric Definition: Percentage of population over age 25 without a bachelor's or professional school degree.
Data Source: 2019 American Community Survey 5-year – Table B15003 – Educational Attainment for the Population 25 Years and Over.
Calculation Method: We totaled the census estimates for educational attainment for the following population categories, which are estimated for the population 25 years and older:

- No schooling
- Nursery school
- Kindergarten through 11th grade
- 12th grade without a diploma
- High school diploma, GED or alternative credential
- Some college without a degree
- Associates degree

We divided this total by the total population 25 years and older.
Potential Limitations and Future Improvements: None discussed.

Unemployment Rate

Metric Definition: Unemployed as percentage in the labor force.
Data Source: 2019 American Community Survey 5-year Table – B23025
Calculation Method: We divided the estimate for the total population that is unemployed in the labor force by the total population in the labor force.
Potential Limitations and Future Improvements: None discussed.

FACTOR #2: RACE, ETHNICITY, AND LANGUAGE

Black or African American Population

Metric Definition: Percentage of population who is Black or African American alone or in combination with one or more other races.
Data Source: 2019 American Community Survey 5-year Tables – B02009 and B01003.
Calculation Method: We divided the estimate for the population of Blacks or African Americans alone or in combination with one or more other races by the total population of the census tract.
Potential Limitations and Future Improvements: None discussed.

Hispanic and Latino Population

Metric Definition: Percentage of Hispanic or Latino/a Origin.
Data Source: 2019 American Community Survey 5-year Table – B03003.
Calculation Method: We divided the estimate for the Hispanic or Latino origin population by the total population of the census tract.
Potential Limitations and Future Improvements: None discussed.

Asian and Asian American Population

Metric Definition: Percentage of population who is Asian alone or in combination with one or more other races.
Data Source: 2019 American Community Survey 5-year – Tables B02011 and B01003.
Calculation Method: We divided the estimate for the population of Asians alone or in combination with one or more other races by the total population of the census tract.
Potential Limitations and Future Improvements: None discussed.

Native American or Indigenous Population

Metric Definition: Percent of tract population who is American Indian, Alaska Native, Native Hawaiian or other Pacific Islander alone or in combination with one or more other races.
Data Source: 2019 American Community Survey 5-year – Tables B02010, B02012, and B01003.
Calculation Method: The Technical Team totaled the estimates for the population of American Indians and Alaska Natives alone or in combination with one or more other races and Native Hawaiians and other Pacific Islanders alone or in combination with one or more other races. We then divided the sum by the total population of the census tract.
Potential Limitations and Future Improvements: None discussed.

Limited English Proficiency

Metric Definition: Percentage of households that are limited English speaking households.
Data Source: 2019 American Community Survey 5-year Table –C16002.
Calculation Method: We totaled the estimates for the number of households that are limited English speaking households (speaking Spanish, Asian and Pacific Island languages, other Indo-European languages, or other languages). We then divided the sum by the total number of households in the census tract.
Potential Limitations and Future Improvements: None discussed.

Historical Redlining

Metric Definition: Historic (1930) redlining 'score' from 1-4 where 4 is most likely to be a redlined area.
Data Source: National Community Reinvestment Coalition (NCRC) 2021.
Calculation Method: The NCRC digitized the mortgage security risk maps of the Home Owners' Loan Corporation (HOLC) from the 1930s. The 'NCRC assigned a numerical value to each HOLC risk category as follows: 1 for "A" grade, 2 for "B" grade, 3 for "C" grade, and 4 for "D" grade. We calculated a historic redlining score from the summed proportion of HOLC residential security grades multiplied by a weighting factor based on area within each census tract.' For the purposes of this metric, if the percentage of the tract area that had an assigned score was zero, the data point was removed. The NCRC did not give final scores for census tracts that

had less than 20% area covered by a score. We manually calculated the score for these low coverage census tracts to include them in this metric by summing the weighted A-E scores NCRC provided for each tract.
Potential Limitations and Future Improvements: There are missing values for areas without scoring coverage, mostly outside of metropolitan areas.

FACTOR #3: HEALTH OUTCOMES AND HEALTHCARE

Asthma Emergency Department Visits

Metric Definition: Age-adjusted annual average rate of emergency department (ED) visits for asthma per 10,000 people.
Data Source: Statewide Planning and Research Cooperative System (SPARCS), a comprehensive database of hospital and emergency department admissions throughout the State; NYSDOH Center for Environmental Health, Bureau of Environmental and Occupational Epidemiology and Center for Community Health, Asthma Program.
Calculation Method: Total number of cases from 2008 to 2012 in each of four age categories (0-4, 5-14, 15-64, 65 and above). Cases were geocoded and assigned to census tracts or census tract aggregations (i.e., aggregated areas), or imputed if they could not be geocoded. The State has created aggregated areas that are a combination of 1) individual census tracts, 2) aggregations of census tracts, and 3) NYC Neighborhood Tabulation Areas, which are pre-existing, census tract-based geographies created by the NYC Department of City Planning. Each of these age groups was divided by the 2010 population estimate from the Decennial Census for that age group in that aggregated area and weighted using the State population age distribution for 2008-2012. These weighted age-specific rates were summed, then divided by 5, to calculate the annual average age-adjusted rate. For aggregated areas that include multiple census tracts, each census tract in the aggregated area was assigned the same overall age-adjusted annual average rate.
Potential Limitations and Future Improvements: These data require aggregation over time and space for rate stability and confidentiality. About 10% of the aggregated areas do not have values because the rate was not calculated (area contains over 50% population in group quarters or fewer than 11 cases), the rate was not stable (the area contains between 11 and 20 cases), or the rate was not applicable (area has no or very unreliable populations). NYS residents seeking care in other states may not be counted. This may especially impact aggregated areas that border another state.

COPD Emergency Department Visits

Metric Definition: Age-adjusted annual average rate of emergency department visits for COPD per 10,000 people.
Data Source: Statewide Planning and Research Cooperative System (SPARCS), a comprehensive database of hospital and emergency department admissions throughout the State; NYSDOH Center for Environmental Health, Bureau of Environmental and Occupational Epidemiology.
Calculation Method: Total number of cases from 2008 to 2012 in each of three age categories (0-34, 35-64, 65 and above). Cases were geocoded and assigned to census tracts or census tract aggregations (i.e., aggregated areas), or imputed if they could not be geocoded. **The State** has created aggregated areas that are a combination of 1) individual census tracts, 2) aggregations of census tracts, and 3) NYC Neighborhood Tabulation Areas, which are pre-existing, census tract-based geographies created by the NYC Department of City Planning. Each of these age groups was divided by the 2010 population estimate from the Decennial Census for that age group in that aggregated area and weighted using the **State** population age distribution for 2008-2012. These age-specific rates were summed, then divided by 5 to calculate the annual average age-adjusted rate. For aggregated areas that include multiple census tracts, each census tract in the aggregated area was assigned the same overall age-adjusted annual average rate.

Potential Limitations and Future Improvements: Health data require aggregation over time and space for rate stability and confidentiality. About 10% of the aggregated areas do not have values because the rate was not calculated (area contains over 50% population in group quarters or fewer than 11 cases), the rate was not stable (the area contains between 11 and 20 cases), or the rate was not applicable (area has no or very unreliable

populations). State residents seeking care in other states may not be counted and outcomes are influenced by access to healthcare. This may especially impact aggregated areas that border another state.

Myocardial Infarction Hospitalizations

Metric Definition: Age-adjusted annual average rate of hospitalizations for myocardial infarction (or heart attack) per 10,000 people.
Data Source: Statewide Planning and Research Cooperative System (SPARCS), a comprehensive database of hospital and emergency department admissions throughout the State; NYSDOH Center for Environmental Health, Bureau of Environmental and Occupational Epidemiology and Center for Community Health, Asthma Program.
Calculation Method: Total number of cases from 2008 to 2012 in each of two age categories (35-64, 65 and above). Cases were geocoded and assigned to census tracts or census tract aggregations (i.e., aggregated areas), or imputed if they could not be geocoded. NYS has created aggregated areas that are a combination of 1) individual census tracts, 2) aggregations of census tracts, and 3) NYC Neighborhood Tabulation Areas, which are pre-existing, census tract-based geographies created by the NYC Department of City Planning. Each of these age groups was divided by the 2010 population estimate from the Decennial Census for that age group in that aggregated area and weighted using the NYS population age distribution for 2008-2012. These age-specific rates were summed, then divided by 5 to calculate the annual average age-adjusted rate. For aggregated areas that include multiple census tracts, each census tract in the aggregated area was assigned the same overall age-adjusted annual average rate.
Potential Limitations and Future Improvements: Health data require aggregation over time and space for rate stability and confidentiality. About 10% of the aggregated areas do not have values because the rate was not calculated (area contains over 50% population in group quarters or fewer than 11 cases), the rate was not stable (the area contains between 11 and 20 cases), or the rate was not applicable (area has no or very unreliable populations). State residents seeking care in other states may not be counted. This may especially impact aggregated areas that border another state.

Premature Deaths

Metric Definition: Percent of deaths that occur among people under age 65.
Data Source: Mortality Vital Statistics Data, New York State Bureau of Vital Records; NYSDOH Center for Environmental Health, Bureau of Environmental and Occupational Epidemiology.
Calculation Method: Total number of deaths from all causes from 2015 to 2019 in each of two age categories (0-64, all deaths with known ages). Deaths were geocoded and assigned to census tracts or census tract aggregations (i.e., aggregated areas), or imputed if they could not be geocoded. The State has created aggregated areas that are a combination of 1) individual census tracts, 2) aggregations of census tracts, and 3) NYC Neighborhood Tabulation Areas, which are pre-existing, census tract-based geographies created by the NYC Department of City Planning. The number of deaths aged 0-64 years was divided by the total number of deaths for whom age was known within each aggregated area. For aggregated areas that include multiple census tracts, each census tract in the aggregated area was assigned the same value.
Potential Limitations and Future Improvements: Mortality data require aggregation over time and space for rate stability and confidentiality. About 10% of the aggregated areas do not have values because the rate was not calculated (area contains over 50% population in group quarters or fewer than 11 cases), the rate was not stable (the area contains between 11 and 20 cases), or the rate was not applicable (area has no or very unreliable populations). **State** residents who died in other states may not be counted.

Low Birth Weight Births

Metric Definition: Percent of births with birth weight below 2500 grams.
Data Source: Live Births Vital Statistics Data, New York State Bureau of Vital Records; NYSDOH Center for Environmental Health, Bureau of Environmental and Occupational Epidemiology.
Calculation Method: Total number of births from 2014 to 2018 in each of two categories (births under 2500 grams, all births with known birth weight). Births were geocoded and assigned to census tracts or census tract aggregations (i.e., aggregated areas), or imputed if they could not be geocoded. NYS has created aggregated areas which are a combination of 1) individual census tracts, 2) aggregations of census tracts, and 3) in NYC Neighborhood Tabulation Areas, which are pre-existing, census tract-based geographies created by NYC

agencies. The number of infants born with birth weight below 2500 grams was divided by the total number of infants for whom birth weight was known within each aggregated area. For aggregated areas that include multiple census tracts, each census tract in the aggregated area was assigned the same value.
Potential Limitations and Future Improvements: Low birth weight may result from a number of factors. Birth data require aggregation over time and space for rate stability and confidentiality. About 10% of the aggregated areas do not have values because the rate was not calculated (area contains over 50% population in group quarters or fewer than 11 cases), the rate was not stable (the area contains between 11 and 20 cases), or the rate was not applicable (area has no or very unreliable populations). State residents who were born in other states may not be counted.

Population With a Disability

Metric Definition: Percentage of tract population with at least one of 6 reported disability types: hearing difficulty, vision difficulty, cognitive difficulty, ambulatory difficulty, self-care difficulty, and independent living difficulty.
Data Source: 2019 American Community Survey (ACD) 5-year table B18101 – Sex by Age by Disability Status.
Calculation Method: We calculated the total population with a disability (males and females in all age categories) and divided by the total population.
Potential Limitations and Future Improvements: None discussed.

Population Over Age 65

Metric Definition: Percentage of the total tract population that is 65 years of age or older.
Data Source: 2019 American Community Survey (ACS) 5-year table S0101 – Age and Sex.
Calculation Method: We divided the population in the census tract that is at least age 65 by the total population in the tract.
Potential Limitations and Future Improvements: This indicator is a proxy for the concepts of power outages, emergency situations, and heat vulnerability due to people over 65 being especially vulnerable in these matters. Future improvements may include those direct indicators if data is available.

Percentage Without Health Insurance

Metric Definition: Percentage of the population without health insurance.
Data Source: 2019 American Community Survey 5-year - Table B27001 Health Insurance Coverage Status by Sex by Age.
Calculation Method: We calculated the total population without health insurance (males and females in all age categories) and divided by the total population.
Potential Limitations and Future Improvements: None discussed.

Housing and Energy

Rented Housing Units

Metric Definition: Percentage of renter occupied housing units.
Data Source: 2019 American Community Survey 5-year - Table B25003 Tenure.
Calculation Method: We divided the estimate of total renter occupied housing units by the total number of housing units.
Potential Limitations and Future Improvements: None discussed.

Rental Housing Cost Burden

Metric Definition: Rental housing costs as a percentage of household income.
Data Source: U.S. Census (2015-2019 ACS) table B25070 -- Gross Rent as a Percentage of Household Income in the Past 12 Months.
Calculation Method: The Technical Team added all of the census categories for population spending 30% or more of their household income on rent (i.e., category for 30-34.9% of income, plus 35-39.9% of income, etc.) and divided by the total population of renter-occupied housing units.

Potential Limitations and Future Improvements: The population included in this metric is only renters. This metric could be expanded in the future to include high housing costs for mortgage owners.

Energy Affordability

Metric Definition: Average energy costs as percentage of income.
Data Source: USDOE Low-Income Energy Affordability Data (LEAD) Tool (U.S. Census Bureau's American Community Survey 2018 Public Use Microdata Samples).
Calculation Method: USDOE used census energy expenditure data, housing unit type data, household income data, and number of people in the household, to model the average energy burden by tract.
Potential Limitations and Future Improvements: The U.S. DOE's estimation approach does have some margin of error (MOE) that they are looking to improve upon by using more measured values in future iterations.

Manufactured and Mobile Homes

Metric Definition: Percentage of housing units that are manufactured or mobile homes.
Data Source: US Census (2015-2019 ACS) table B25024 – Units in Structure.
Calculation Method: We divided the estimate for the number of mobile homes by the total number of housing units.
Potential Limitations and Future Improvements: None discussed.

Households without Internet Access or Internet Subscription

Metric Definition: Percentage of census tract households with no internet access.
Data Source: US Census (2015-2019 ACS) table B28002 – Presence and Types of Internet Subscriptions in Household.
Calculation Method: We divided the total population without internet access by the total population.
Potential Limitations and Future Improvements: While this metric addresses access to internet, it does not address the financial cost of internet access. Stakeholders wanted to also capture the potentially high cost of an internet or cellular subscription. When or if this information is available through another data source at the census tract geography level with the State coverage, a future metric could include the burden of a subscription as a percentage of income.

Homes Built Before 1960

Metric Definition: Percentage of housing units that are built before 1960.
Data Source: EPA EJScreen (2017 American Community Survey CS 5-year - Table B25034).
Calculation Method: We rolled up the block group-level EJSCREEN data to the tract-level by taking a weighted average of the block group observations, weighted by the proportion of the census tract population that was in the block group.
Potential Limitations and Future Improvements: Homes Built Before 1960 was used as a proxy indicator due to its associate with lead-based paint and dust risk. A data source with reportable data at the census tract level on actual lead-based paint or dust records does not exist currently.

7. ANNUAL REVIEW

In compliance with the Climate Act, the CJWG will review the DAC criteria annually and may, at the option of the CJWG, modify methods used in this report to incorporate updated and new data, and scientific findings.

8. APPENDIX

8.1 Census Tract Geography Considerations

After considering three different units of analysis: (1) block group; (2) census tract; and (3) sub-county areas such as state aggregate areas, we selected the census tract, which is commonly used for neighborhood-level analysis and environmental justice and DAC screen tools, as the unit of analysis and geographic definition of a community for the purposes of defining DACs.

There were three primary areas of consideration in this decision: (1) the availability, reliability, and stability of data for the selected unit; (2) representing how State Agencies might manage actions or decisions that affect how spending or benefits flow to a community; and (3) selecting an area people might identify as a community. Table 2 provides an overview of these three geographic definitions and key considerations gathered through reviewing technical documentation from EJScreen, CalEnviroScreen, NYSDOH, and NYC and conferring with NYSDOH.

Table 9. Geographic Definitions Considered

Geographic Boundary	Number in New York	Key Considerations
Block Group (U.S. Census Bureau)	15,464 in New York	Too small for reliable/stable estimates of some environmental, population and health indicators. Much of the data we need is not available or differentiated at this level. Too small for directing or allocating community-scale efforts and/or public engagement.
Census Tract (U.S. Census Bureau)	4,918 in New York Average of 3,989 people and 1,488 households per block group	Good environmental and census data available Some experts still caveat that data may be less stable at this level (especially health data). The NYSDOH Environmental Public Health Tracking Program has created aggregated areas, consisting of census tracts or aggregations of census tracts, to better accommodate issues with small numbers. Generally, not too big nor too small relative to other options.
Sub-county areas* (e.g., Aggregate Areas; Neighborhood Tabulation Areas[10] State Agencies	NYSDOH aggregate areas (as one example): 1,153 in the State Average of 17,015 people and 6,346 households per area	More reliable data for some environmental, census and health indicators (lower measurement error). Developed and used by some state and local agencies (e.g., NYC Planning and NYSDOH). Might be too large for (a) prioritizing pollution reduction efforts or (b) measuring or allocating the benefits of clean energy and energy efficiency investments.

*These could be a combination of one or multiple census tracts to define a slightly larger neighborhood or community, for the purposes of better data quality or reliability. For example, the NYC Department of Planning uses Neighborhood Tabulation Areas (NYC Planning) and

[10] The Population Division at NYC City Planning considers some demographic, housing and poverty data from the American Community Survey (ACS) to be unreliable for small areas. For better precision, they aggregate census tracts into Neighborhood Tabulation Areas (NTAs).

for some health statistics (such as Environmental Public Health Tracking), the NYSDOH aggregates data to a sub-county level (sometimes called an Aggregate Area).

The following sections provide more detail on the rationale and considerations for selecting the census tract as the unit of analysis. While we considered representing how New York State Agencies might manage actions or decisions that affect how spending or benefits flow to a community and selecting an area that people might identify as a community, the availability, reliability, and stability of data weighed most heavily in the decision.

8.1.1 Availability, Reliability, and Stability of Data

In selecting the unit of geography to use in the analysis, we needed to use a common definition that has reliable and publicly available data for the many things we need to measure; therefore, we had to use a census-based designation like block groups or census tracts rather than political boundaries. We also needed to use data that is reliable and stable.

Considerations and trade-offs between the different geographic boundaries considered related to the availability, reliability, and stability of data include:

- **Census data availability** - Much of the census data needed is available at the block group level but has high measurement error. Some census data (e.g., housing/energy costs, disability status, nativity/citizenship, income by race) is not available at block group level (only census tract).
- **Health data availability** - Many state health indicators are reported at the county level. Fewer are reported at the sub-county level (i.e., ZIP code or census tract), and some of those are only available by ZIP codes that do not align with census tracts. Even if data confidentiality allows finer-grained reporting, some public health experts and epidemiologists think rates unreliable below sub-county level. The NYSDOH Environmental Public Health Tracking Program has created aggregated areas, consisting of census tracts or aggregations of census tracts (which for NYC are Neighborhood Tabulation Areas), to better accommodate issues with small numbers.
- **Pollution data availability** – U.S. EPA NATA variables ($PM_{2.5}$, diesel, respiratory hazard risk, cancer risk) are only differentiated at the census tract level. EJScreen publishes pollution and hazard data at the block group level, but anything from U.S. EPA NATA is applied from census tract level (all block groups within a census tract have the same values).
- **State GIS Data** - Many GIS-based indicators like air quality, land use and density, and storm surge/sea level risk, can be calculated at the block group level. However, when the underlying data is based on models (e.g., air quality diffusion model), measurement error will be higher for smaller areas.
- **Uncertainty and Measurement Error** - Data reliability and validity concerns are greater as the geographic areas get smaller, with margins-of-error generally larger for smaller areas. Though many federal and state government data users focus on small geographic areas such as census tracts and block groups, some agencies warn that uncertainty and measurement error is higher for smaller areas.[11] Even with five years of pooled data, ACS estimates for these small areas often have a large MOE .[12] This

[11] Per EPA EJScreen Technical Documentation (https://www.epa.gov/ejscreen/technical-documentation-ejscreen) “Demographic estimates for a single block group are often based on a small sample of the local population and are uncertain. Similarly, some environmental indicator estimates are derived from lower-resolution data, and all involve uncertainty. Therefore, it is typically very useful and advisable to summarize EJSCREEN data within a larger area that covers several block groups” “The demographic uncertainty combined with uncertainty in environmental data means EJ index values are often quite uncertain for a single block group.”
Per California OEHHA, Responses to CalEnviroScreen 3.0 comments (https://oehha.ca.gov/media/downloads/calenviroscreen/comment/ces3responsetocomments.pdf) “some of the data used in CalEnviroScreen is either unavailable or statistically unreliable at the census block group scale”

[12] See, for example: Census handbook: https://www.census.gov/content/dam/Census/library/publications/2020/acs/acs_state_local_handbook_2020_ch02.pdf
Patterns and causes of uncertainty in the American Community Survey: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4232960/

means that these are not necessarily a strong or reliable measure to use to compare communities. For example, a wide **MOE** could mean you falsely judge one community as more vulnerable (or facing more threats) than its neighbor, when in reality, the communities could be the same or the opposite relationship.

- **Confidentiality Concerns** - Some State Agencies aggregate data above census tract level to protect confidentiality or improve stability and reliability of estimates. An **Aggregate Area** could be NYC Neighborhood Tabulation Areas, Multiple census tracts, or single census tracts.

- **Prevalence in Environmental Justice and DAC Screen tools** – The census tract is commonly used for neighborhood-level analysis and environmental justice and DAC screen tools. As noted in responses to CalEnviroScreen 3.0 comments, "We believe census tracts are currently the most useful scale of analysis for the CalEnviroScreen tool. Using census blocks groups, which are smaller than census tracts, and census designated places would be difficult since comparison would have to be made with census blocks groups statewide." "Further, some of the data used in CalEnviroScreen is either unavailable or statistically unreliable at the census block group scale."[13]

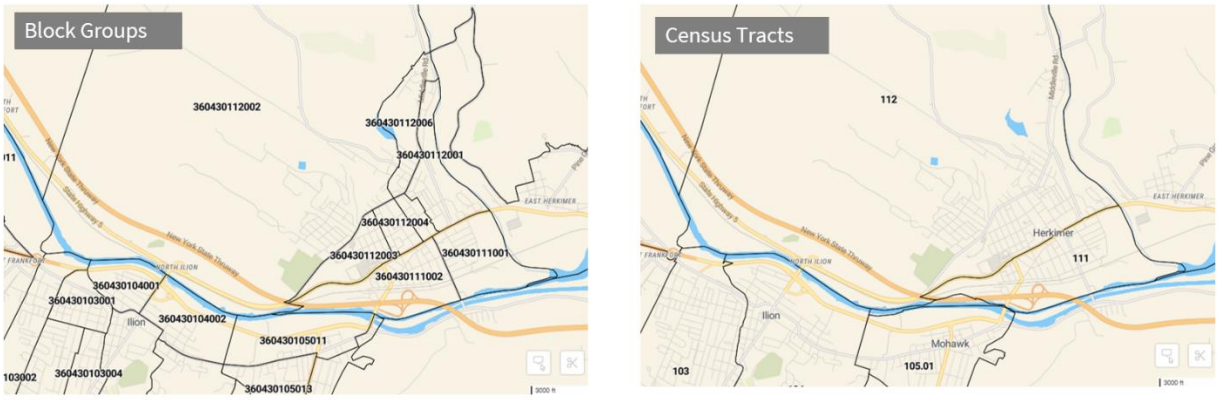
8.1.2 Representing How NYS Agencies Might Manage Actions or Decisions

Another area considered is how State Agencies will use the DAC criteria in decision-making.

For the purposes of directing, allocating, and measuring the benefits of investments to DACs, the Technical Team considered the level that best represents how benefits can be "placed" in or directed to a geographic area. For example, there are some investments where 100% of benefits go to one particular point on a map, while some may have a slightly wider influence, so assigning the benefits to a single place may underrepresent the flow of benefits. Similarly, one has to consider the usefulness of block-group-level information for directing or managing State Agency actions such as public outreach or engagement, directing resources or understanding the impact of those actions. Figure 11 illustrates the difference in size between block groups and census tracts.

For the purpose of prioritizing pollution reduction efforts and preparing regulatory impact statements, for some exposures and burdens with known boundaries, smaller geographic areas may provide a better way to target efforts than larger areas (e.g., city/town or aggregate area), though a block group may be smaller than the extent of environmental exposures or burdens.

Figure 11. Illustration of Block Groups and Census Tracts in and near Herkimer, NY



[13] California OEHHA, Responses to CalEnviroScreen 3.0 comments: https://oehha.ca.gov/media/downloads/calenviroscreen/comment/ces3responsetocomments.pdf

8.1.3 Selecting an Area that People Identify as a Community

Lastly, the Technical Team took into account what areas might reasonably be considered a community as we wanted to select a geographic boundary that people might identify as a community, while also balancing not selecting an area that would be too big or too small.

As shown above in Table 9, there are 1,153 Aggregate Areas, 4,918 census tracts, and 15,464 block groups in the state. While none of the geographic boundaries we considered have a name that someone might recognize as a community like a town or neighborhood name, census tracts are about the right size to represent a community for the purposes of the DAC criteria.

The Aggregate Areas are the largest of the boundaries considered, averaging 17,015 people and 6,346 households in each, which is on the large size and more likely to include a wider range of demographics. New York State census tracts average 3,989 people and 1,488 households each, and generally nest into towns. Each census tract is comprised of multiple block groups that average 1,269 people and 473 households each.

8.2 Considered Indicators

This section lists all indicators that the CJWG considered for inclusion into the DAC criteria, including indicators that were selected for the criteria (bolded indicators) and not selected (non-bolded indicators). The table indicates if the Technical Team identified potential data for each indicator, and if so, whether the data was obtained, calculated or screened for inclusion. Additionally, the rationale for potential inclusion is listed for each indicator and potential limitation to the inclusion of indicators that were not selected for the criteria.

8.2.1 Indicators Considered - Environmental Burdens and Climate Change Risks

Bolded indicators are included in the criteria. All others were considered, but are not currently included (though they may be similar to, or correlated with, included indicators).

Table 10. Indicators Considered to Represent Community Burdens (Pollution, hazards, land use and environmental factors, built environment & access, climate and weather risks)

Indicator	Potential Data Source(s)	Data Collected and Analyzed?	Included in DAC Criteria?	Potential Limitations
Particulate matter (2.5) air concentration	**U.S. EPA EJScreen (Office of Air and Radiation (OAR)) estimated 2016 $PM_{2.5}$ ambient annual average concentrations using a Bayesian space-time downscaling fusion model.**	**Yes**	**Yes**	**$PM_{2.5}$ modeled concentrations are based upon 2016 estimates and may no longer reflect current conditions. The estimates are annual averages. Short-term averaging times may have been used in studies where health effects have been documented.**
Vehicle traffic density	**U.S. EPA EJScreen - Count of vehicles based on average annual daily traffic at major roads within 500 meters of a census tract, divided by distance in meters. Calculated from 2017 USDOT traffic data.**	**Yes**	**Yes**	**Studies show impacts from traffic decrease significantly as distance from the road increases.[1, 2]** **500 meters may be too great of a distance and could be including neighborhoods less likely to be considered disproportionately burdened. This large distance could be diluting localized effects and may make it difficult to identify disproportionate impacts in densely populated urban areas.**
Benzene air concentration	**U.S. EPA National Air Toxics Assessment modeled annual average ambient concentration based on emissions from 2014**	**Yes**	**Yes**	**Represents historical emissions from 2014 and may not accurately reflect current conditions. Emissions inventory is developed from surrogate information such as population density and not an actual count of vehicles or gasoline-powered equipment. Monitored benzene concentrations in the State show a decrease in ambient levels since 2014.**
Diesel truck and bus traffic	**NYS Roadway Inventory System NYSDOT Traffic Viewer, annual average daily traffic counts for 2019 using Federal Highway Administration vehicle classes 4-13**	**Yes**	**Yes**	**Traffic count is one indicator of the magnitude of emissions. A notable limitation with this method is the assumption of a uniform distribution within the buffer zone of vehicle class and emissions. Other variables including vehicle mix, vehicle speed, traffic flow, meteorology, built environment, and**

Indicator	Potential Data Source(s)	Data Collected and Analyzed?	Included in DAC Criteria?	Potential Limitations
				vegetation may cause considerable variation in exposure to emissions around roads.
Diesel particulate matter concentrations	U.S. EPA EJScreen from EPA's National Air Toxics Assessment modeled annual average ambient concentrations based on emissions from 2014	Yes	No	Diesel exhaust is a mixture of particulate matter and gaseous pollutants for which a health-based air quality standard is difficult to develop. Because of uncertainties in the emission inventory, development and errors identified by NYSDEC staff, NYSDEC recommends using proximity of trucks and buses as a surrogate for diesel exposures.
Formaldehyde concentration	U.S. EPA EJScreen from EPA's National Air Toxics Assessment modeled annual average ambient concentrations based on emissions from 2014	Yes	No	Formaldehyde is mostly a secondary formation from volatile organic compounds released from biogenic, industrial, and mobile sources. Formaldehyde is highly correlated with benzene. The emission inventory developed for formaldehyde is based on information which involves population density. Inclusion of this layer would be redundant.
Volatile organic compounds (VOCs)	Total VOCs are not monitored or modeled	No	No	VOCs do not have a health-based comparison value. Limited monitoring locations in the State for specific VOCs.
Ozone concentrations	U.S. EPA EJScreen (Office of Air and Radiation (OAR)) estimated 2016 concentrations using a Bayesian space-time downscaling fusion model)	Yes	No	Not a consistent measure of local (on-the-ground) air quality and could be from out-of-State sources. Ozone concentrations are generalized over a large area and not reflective of a local hotspot.
Sulfur oxides concentrations	NYSDEC (monitored data)	No	No	Little variation and low concentrations due to the requirement for low-sulfur fuels in the State. Limited monitoring locations in the State.
Nitrogen oxides concentrations	NYSDEC (monitored data)	No	No	Nitrogen oxides play a role in ozone chemistry. Limited monitoring locations in the State.
Carbon monoxide concentrations	NYSDEC (monitored data)	No	No	Low carbon monoxide levels in the State, demonstrate attainment for this pollutant with the federal National Ambient Air Quality Standards. Limited monitoring locations in the State.
Woodsmoke emissions	NYSERDA spatial modeling of woodsmoke (2010)	No	No	Sub-county data are not available.
Cancer risk from air toxics	U.S. EPA EJScreen from EPA's National Air Toxics Assessment modeled annual average ambient concentrations based on emission from 2014	Yes	No	Not necessary to include due to correlation with benzene, which is included.
Respiratory risk from air toxics (hazard index)	U.S. EPA EJScreen from EPA's National Air Toxics Assessment modeled annual average ambient concentrations based on emission from 2014	Yes	No	Modeled rather than direct measurement. Estimate is a hazard quotient, which is the ratio of modeled air concentration to a chemical's health-based reference concentration. Not necessary to include because highly correlated with $PM_{2.5}$ and benzene.
Proximity to wastewater discharge	**U.S. EPA EJScreen Toxic Release Inventory (TRI) Risk Screening Environmental Indicators (RSEI)**	**Yes**	**Yes**	**The RSEI model calculates results for direct water releases from facilities to streams and waterbodies. The results may not represent actual population exposures. Individuals would need to come into contact with the contaminated water either by swimming or drinking the water.**
Impaired water bodies	New York State 2018 Section 303(d) List of Impaired/TMDL Water	No	No	Many decisions required on what suspected sources, causes, pollutants to include and how to weight. Deprioritized for scenarios.
Clean Watersheds Needs Survey	Did not pursue	No	No	Not a direct measure of water quality.
Combined sewer overflows (CSOs)	Did not pursue	No	No	The presence of CSOs is not a direct measure of water quality and may not represent direct human exposure. Municipalities with CSO discharges are permitted by NYSDEC and are subject to discharge control policies by U.S. EPA. Communities with CSO systems prepare control plans to address discharges and comply with State and federal requirements. The amount and type of contaminants in the discharge are unknown and, if occurring, highly variable during a rain or snow event.
State Pollution Discharge Elimination System permits (SPDES)	Did not pursue	No	No	Not a direct measure of water quality. Does not represent direct human exposure. Individuals would need to come into contact with the contaminated water either by swimming or drinking the water.

Indicator	Potential Data Source(s)	Data Collected and Analyzed?	Included in DAC Criteria?	Potential Limitations
NYSDOH fish consumption advisories	Did not pursue	No	No	More direct water quality measures may be available. This may not be the best indicator for water quality exposures.
Concentrated animal feeding operations (CAFOs)	NYSDEC	No	No	Research has documented that CAFO emissions can negatively impact human health for individuals who work inside buildings with poor ventilation for extended periods of time. Less is known about the human health impacts on neighboring residents.
Per- and Polyfluoroalkyl Substances (PFAS)	Did not pursue	No	No	Research is still ongoing to determine how different levels of exposure to different PFAS can lead to a variety of health effects. Research is also underway to better understand the health effects associated with low levels of exposure to PFAS over long periods of time, especially in children. Additionally, air, water, and soil measurements of PFAS chemicals have been collected in communities where PFAS contamination has been identified but measurements are not routinely made and are not statewide. Due to their widespread production and use, as well persistence in the environment, surveys conducted by the Centers for Disease Control and Prevention show that most people in the U.S. have been exposed to some PFAS.
Algal blooms in freshwater lakes	Did not pursue	No	No	Data source unavailable at census tract geography level.
Childhood lead exposure	NYSDOH Possible data sources to evaluate: https://health.data.ny.gov/Health/Childhood-Blood-Lead-Testing-and-Elevated-Incidenc/d54z-enu8	No	No	Data not available at census tract level.
Pesticide use	Did not pursue	No	No	Data available only for commercial permit holders who sell or offer for sale restricted use pesticides and those who sell agricultural pesticides. Data does not represent location of applied pesticides and therefore would not represent community exposures.
Noise pollution	Did not pursue	No	No	No threshold for the determination of a health effect; noise is not measured on a routine basis. Could use surrogates such as proximity to railyards, airports, trucking routes/roadways.
Radon	Did not pursue	No	No	Data not available at the census tract level.
Proximity to remediation sites	**NYSDEC's database on the State's Brownfield Cleanup program and Class II, and federal environmental remediation sites (USEPA National Priority List) sites as of July 26, 2010**	**Yes**	**Yes**	**Does not consider dispersion and toxicity of pollutants and magnitude of emissions. Metric is based on counts of overlap between tract and a buffer around facility, but not degree of overlap.**
Proximity to risk management plan (RMP) sites	**U.S. EPA EJScreen (RMP database) – count of facilities within 5 km, divided by distance and weighted by population**	**Yes**	**Yes**	**While these data may not represent direct exposure, it does represent risk of exposure during accidental releases and that could be considered a disproportionate burden on a community.**
Proximity to power generation facilities	**NYSDEC 2019 fossil-fuel power generation facilities, including peakers, and USEPA Emissions & Generation Resource Integrated Database (eGRID)**	**Yes**	**Yes**	**Captures location but does not consider dispersion and toxicity of pollutants and magnitude of emissions. Metric is based on counts of overlap between tract and a buffer around facility, but not degree of overlap.**
Proximity to major oil storage facilities	**NYSDEC major oil storage facilities as of July 20, 2010 (NYSDEC, 2010)**	**Yes**	**Yes**	**Does not consider type of petroleum product stored, dispersion and toxicity of pollutants and magnitude of emissions. Metric is based on counts of overlap between tract and a buffer around facility, but not degree of overlap.**
Proximity to active landfills	**Locations of active landfills operating in 2021, obtained from NYSDEC's Division of Materials Management (NYSDEC 2021)**	**Yes**	**Yes**	**Community burden without known exposures. Proximity indicator does not consider movement of pollutants from the landfill (either by water or air), toxicity of pollutants and magnitude of releases. Metric is based on counts of overlap between tract and a buffer around facility but not degree of overlap.**
Proximity to scrap metal processing and vehicle dismantlers	**Locations of active vehicle dismantlers and scrap metal processing facilities operating in 2021, obtained from NYSDEC's Division of Materials Management (NYSDEC 2021)**	**Yes**	**Yes**	**Community burden without known exposures. Proximity indicator does not consider dispersion and toxicity of pollutants and magnitude of emissions. Metric is based on count within tract.**

Indicator	Potential Data Source(s)	Data Collected and Analyzed?	Included in DAC Criteria?	Potential Limitations
Proximity to municipal waste combustors	**Locations of active municipal waste combustors operating in 2021, obtained from NYSDEC's Division of Materials Management (NYSDEC 2021)**	**Yes**	**Yes**	**Community burden without known exposures. Proximity indicator does not consider dispersion of pollutants from, toxicity of pollutants and magnitude of releases. Municipal waste combustors are highly regulated with strict emission requirements. Metric is based on counts of overlap between tract and a buffer around facility but not degree of overlap.**
Proximity to National Priority List (NPL) Sites (Superfund sites)	U.S. EPA EJScreen (Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) database) count of sites within 5 km of the census tract, divided by distance and weighted by population	Yes	No	Most if not all NPL sites are already included in this indicator, Proximity to State and federal environmental remediation sites (USEPA National Priority List and NYSDEC Brownfield and Class II sites).
Proximity to Hazardous Waste Management Facilities (treatment, storage, disposal facilities; TSDFs)	U.S. EPA EJScreen (RCRAInfo Database)	Yes	No	NYSDEC staff identified issues with these data and thought the discrepancies found provided unreliable information. For example, both permitted and non-permitted hazardous waste generators are included and given the same weight. A non-permitted generator would be a pharmacy with nicotine patches onsite. Additionally, staff were uncertain that every hazardous waste generator was included in the USEPA's data.
Facilities with Hazardous Waste Reduction Plan	NYSDEC	No	No	*Proximity to Risk Management Plan Sites* and *Proximity to Wastewater Discharge Facilities* are better indicators of risk from sites handling waste. Inclusion of Facilities with Hazardous Waste Reduction Plans would be redundant.
Proximity to air toxic release	U.S. EPA Toxic Release Inventory (TRI)	No	No	Due to reporting criteria of minimum number of employees, specific industry sector, and chemical threshold criteria, these data do not represent a complete inventory of sources releasing air toxics. Reporting metrics are binned. These sources are already included in benzene NATA and $PM_{2.5}$ modeling results. Proximity indicator does not consider dispersion and toxicity of pollutants and magnitude of emissions.
Proximity to peaker plants only	NYSDEC	No	No	Covered by Proximity to power generation facilities burning fossil fuel, includes peaker units, and therefore not needed separately.
Waste Transfer Stations	NYSDEC	No	No	Community burden without known exposures. NYSDEC receives fewer complaints about transfer stations than other larger, waste handling facilities.
Industrial, mining, and manufacturing land area	**HCR (NYS); PLUTO (NYC)**	**Yes**	**Yes**	**Not all areas represent exposures, risks, or threats.**
Vacant housing units	**2019 ACS 5-year DP024**	**Yes**	**Yes**	**n/a**
Indigenous/Indian Nation territory	**Census (federally designated reservation); NYSDEC (Nation-owned land parcels outside of reservations)**	**Yes**	**Yes (all 19 tracts automatically included)**	**Not all Indigenous communities are the same, and different communities have different histories. Some may not have environmental burdens, and others may not have low-income populations. However, all Native people within the U.S. have experienced colonial practices resulting in ethnocide, genocide, and attacks to political sovereignty.** **Additionally, Indigenous/Indian Nations are political sovereigns, and the State relates to the Nations on a government-to-government basis with appropriate leadership, rather than on an individual level.**
Public utility and waste treatment land area	HCR (NYS); PLUTO (NYC)	Yes	No	Not all areas represent exposures, risks, or threats. May be duplicative/redundant with other waste-related indicators.
Bank branches in area	NYS GIS (Federal Deposit Insurance Corporations data)	Yes	Yes	Less direct measure of redlining than *Historical Redlining Score*.
Mortgages to people of color	Did not pursue	No	No	Captured by Census data on renters and race/ethnicity (mortgage discrimination means more renters).
Unbanked or underbanked households	FDIC	No	No	Data source unavailable at census tract geography level.
Brownfield Opportunity Areas	NYSDOS	Yes	No	Not necessary because remediation sites are included. BOAs are identified through a self-nomination process (in addition to income level).

Indicator	Potential Data Source(s)	Data Collected and Analyzed?	Included in DAC Criteria?	Potential Limitations
Transportation land area	HCR (NYS); PLUTO (NYC)	Yes	Yes	Upon review, land use codes do not cover some large transportation facilities, which may be classified elsewhere (e.g., as public utility or industrial use).
Displacement or Out-Migration	Census (but not at tract level)	No	No	Unable to know the starting place of a migrant population with available data; meaningful migration data is county-level. While possible to capture net migration by census tract, difficult to assess whether a net decrease or increase is a burden.
In-migration / Gentrification	Census (but not at tract level)	No	No	Unable to know the starting place of a migrant population with available data; meaningful migration data is county-level. While possible to capture net migration by census tract, difficult to assess whether a net decrease or increase is a burden.
Flooding in coastal and tidally influenced areas (projected)	**NYSDOS**	**Yes**	**Yes**	**Though projections are useful for identifying future risk areas, there is uncertainty in forecasting models.**
Flooding in inland areas (projected)	**Modeled from NCAR**	**Yes**	**Yes**	**Though projections are useful for identifying future risk areas, there is uncertainty in forecasting models.**
Pluvial flooding (flash and surface flooding)	First Street Foundation https://floodfactor.com/	No	No	Data (outside of NYC) not available. First Street Foundation (FSF) has estimated current and future combined risk of fluvial, pluvial, tidal and surge flooding at 30m resolution. Only combined risk for residential properties is available on website, but data on pluvial risk may be available through arrangement with FSF. See https://firststreet.org/data-access.
Damage ratio of coastal flooding	FEMA National Risk Index for Natural Hazards (NRI)	Yes	No	Based on past damage, which may not reflect extent of climate change risk. State agency staff prefer NYSDOS metric.
Damage ratio of riverine flooding	FEMA NRI	Yes	No	State agency staff prefer custom metric using FEMA floodplain + 100-year-flood return interval.
Land area (or housing units) in flood zone	FEMA, or New York University Furman Center	No	No	Captured by NYSDOS coastal hazard risk areas.
Sea level rise (historic or projected)	NYSERDA ClimAID models	No	No	Captured by *Flooding in coastal and tidally influenced areas*,which accounts for sea level rise, among other factors. Comparability to other metrics depending on time horizon of chosen projection.
Susceptibility to extreme weather	National Renewable Energy Lab (NREL)	Yes	No	This is not a continuous variable, but rather, an index created from modeling. Individual indicators may better represent regional and local differences in climate risks.
Damage ratio of strong winds	FEMA NRI	Yes	No	Based on past damage, which may not reflect extent of future climate change risk.
Damage ratio of ice storms	FEMA NRI	Yes	No	Based on past damage, which may not reflect extent of future climate change risk.
Damage ratio of droughts	FEMA NRI	Yes	No	Only calculated for agricultural land, though droughts can have non-agricultural impacts. Based on past damage, which may not reflect extent of future climate change risk.
Projected high temperature (90+) days	**NYCCSC**	**Yes**	**Yes**	**Considered, but did not try to forecast the number of heat waves (consecutive 90+ degree days).**
Low vegetative cover	**USGS National Land Cover Database**	**Yes**	**Yes**	**Some areas without vegetative cover may still have natural cover like sand rather than developed land. Does not account for protective effect of open water.**
Agricultural land use	**USGS National Land Cover Database**	**Yes**	**Yes**	**n/a**
Current number of high temperature (90+) days	NYCCSC (1980-2020)	Yes	No	Current state may not reflect future risks - Staff recommend projections.
Housing density	2019 ACS 5-year S2501, NYS GIS shapefiles	Yes	No	Not necessary to include because of high correlation with *vehicle traffic density*, $PM_{2.5}$ (modeled on density), *benzene concentration* (modeled on density), and *vegetative cover*.
Housing stock (single family, multifamily)	Census data	No	No	Correlated with *housing density*.
Developed land	USGS National Land Cover Database	Yes	Yes	Correlated with vegetative cover, and vegetative cover also reflects green space.

Indicator	Potential Data Source(s)	Data Collected and Analyzed?	Included in DAC Criteria?	Potential Limitations
Green space per capita	EnviroAtlas	Yes	No	Correlated with vegetative cover and vegetative cover is more commonly used to represent heat island effect.
Limited water storage	None found at tract level	No	No	Could not locate suitable data source.
Percent of workforce in agricultural jobs / Percent of economy from agricultural industry	Bureau of Labor Statistics	No	No	Not available at census tract level. Using agricultural land use instead for geographic granularity.
Emergency Room Drive time to healthcare facilities	**NYSDOH and Oak Ridge National Laboratory (ORNL)**	**Yes**	**Yes**	**Does not account for traffic or public transportation options.**
Public transportation	U.S. EPA Smart Location Database	Yes	No	Missing statewide transportation system coverage; only includes transit in NYC area, Albany, Buffalo, Syracuse. Missing data too significant to include.
Walkability	U.S. EPA Smart Location Database	Yes	No	Measured as intersection density, which may not reflect a walkable neighborhood in some areas. Data appeared to have extreme outliers.
Distance to food stores (or low access/food deserts)	U.S. Department of Agriculture Economic Research Service	Yes	No	This indicator uses a binary approach to flag low access areas across the state. It is a static distance threshold for both rural and urban areas, with alignment needed on either the appropriate threshold for different regions or the creation of a continuous variable.

8.2.2 Indicators Considered to Represent Population and Health Vulnerabilities

Bolded indicators are included in scenarios. All others were considered but not are currently included (although they may be similar to, or correlated with, included indicators).

Table 11. Indicators Considered to Represent Population and Health Vulnerabilities

Indicator	Potential Data Source(s)	Data Collected and Analyzed?	Included in DAC Criteria?	Potential Limitations
Population earning less than 80% of Area Median Income	**Housing and Urban Development (from Census data)**	**Yes**	**Yes**	**Does not capture extreme poverty (therefore we recommend including <100% FPL as well).Aer**
Population at or below 100% Federal Poverty Level	**2019 ACS 5-year C17002**	**Yes**	**Yes**	**Indexed to a federal level rather than regional level (therefore we recommend including <80% AMI as well)**
Single parent households	**2019 ACS 5-year DP02**	**Yes**	**Yes**	**n/a**
Median income	2019 ACS 5-year B19013	Yes	No	Not normalized by area or household size (whereas <80% area median income accounts for both, and <100% FPL accounts for household size.
Tract median income as a percent of area median income	Census	No	No	Data source unavailable at census tract geography level. Not necessary after including *Population earning less than 80% AMI* indicator.
HUD Qualified Census Tracts	HUD	Yes	Yes	Binary metric that includes income and poverty rates, which are already included.
Household savings	Did not pursue	No	No	Data source unavailable at census tract geography level.
Access to capital	FDIC	No	No	Data source unavailable at the census tract geography and correlated with unbanked and underbanked population.
High debt burden	Did not pursue	No	No	Data source unavailable at census tract geography level.
Ability to pay index	NREL	Yes	No	Modeled metric with a higher weight on income than on housing costs. Not necessary after including several income,rental cost burden and energy burden indicators.
Income constrained population	Asset Limited, Income Constrained, Employed	No	No	Data source unavailable at census tract geography level. Not necessary after including other income indicators.

Indicator	Potential Data Source(s)	Data Collected and Analyzed?	Included in DAC Criteria?	Potential Limitations
Income inequality	Did not pursue	No	No	Data source unavailable at census tract geography level.
Child poverty rate	2019 ACS 5-year S1701	Yes	Yes	Not necessary after including population poverty rate and single-parent households.
Free or reduced-price lunch recipients	NYS Department of Education	Yes	No	Less direct measure of income than other included income indicators. Requires transformation from city and town or school geography basis to the census tract level.
Adults without a bachelor's degree	**2019 ACS 5-year B15003**	**Yes**	**Yes**	**n/a**
Adults without a high school diploma	2019 ACS 5-year S1501	Yes	No	Not necessary after including percentage of adults without bachelor's degree.
School class size	NYS Department of Education	Yes	No	Not as direct a measure of income or SES as other proposed metrics. Requires transformation from city and town or school geography basis to the census tract level.
School closings	Did not pursue	No	No	Data not available consistently throughout the state.
Unemployment rate	**2019 ACS 5-year B23025**	**Yes**	**Yes**	**n/a**
Free or reduced-price lunch recipients	NYS Department of Education	Yes	No	Less direct measure of income than other included income indicators. Requires transformation from city and town or school geography basis to the census tract level.
Historical Redlining Score (from 1930s redline)	**NCRC**	**Yes**	**Yes**	**Missing values for areas without scoring coverage.**
Black or African American population	**2019 ACS 5-year B02009**	**Yes**	**Yes**	**n/a**
Hispanic/Latino population	**2019 ACS 5-year B03003**	**Yes**	**Yes**	**Broad definition of Latino/a population that does not capture unique experiences, burdens or vulnerabilities by culture or country of origin. However, more granular data is not reliable for small geographies.** **Underrepresents undocumented people due to census participation/eligibility and limitations in questions on ethnicity.**[3]
Asian and Asian American population	**2019 ACS 5-year B02011**	**Yes**	**Yes**	**Census definition of Asian includes diversity of ethnicities, at diversity of income and education levels. However, more granular data is not reliable for small geographies.** **Highly correlated with language variables; language indicators may better capture vulnerabilities of some Asian and Asian American communities.**
American Indian, Alaska Native, Native Hawaiian or other Pacific Islander population	**2019 ACS 5-year B02010 and B02012**	**Yes**	**Yes**	**Very few census tracts have high proportions of Native/Indigenous individuals, such that using percentile scores (as in our scoring system) does not effectively capture these communities.** **Staff is considering including Native/Indigenous land or territories more explicitly (outside of scoring)**
Non-White alone population (at least one race other than white)	2019 ACS 5-year B03002	Yes	Yes	Too general of an indicator; CJWG prefers to represent racial and ethnic groups separately.
Country of Origin among Hispanic/Latino Population	2019 ACS 5-year B03001	No	No	This more granular data is not reliable for small geographies. May underrepresent undocumented people due to census participation/eligibility and limitations in Census questions on ethnicity.
Foreign-born population	2019 ACS 5-year B05002	Yes	Yes	Highly correlated with limited English Proficiency which more directly represents the concept.
Undocumented and unauthorized population	Did not pursue	No	No	Data source unavailable at census tract geography level.
Racially and Ethnically Concentrated Areas of Poverty (R/ECAP)	HUD	Yes	No	Modeled index metric. Not necessary after including its components (income, race and ethnicity).
Language				
Limited English proficiency	**2019 ACS 5-year C16002**	**Yes**	**Yes**	**n/a**

Indicator	Potential Data Source(s)	Data Collected and Analyzed?	Included in DAC Criteria?	Potential Limitations
Language other than English spoken at home	2019 ACS 5-year S1601	Yes	No	Correlated with limited English proficiency, which may be a stronger indicator of communication challenges with respect to climate and energy investments.
Linguistically isolated	USEPA EJScreen (ACS 5-year)	Yes	No	Replaced with "limited English proficiency," which captures people's self-report of how well they speak English.
Policing and Incarceration				
Incarceration rates	NYS Division of Criminal Justice Services	No	No	Data source unavailable at census tract geography level (though future improvements could request and process data to census tract level).
Shooting or deaths by police officers	NYS Division of Criminal Justice Services	No	No	Data source unavailable at census tract geography level (though future improvements could request and process data to census tract level).
Asthma Emergency Department Visits	NYSDOH	Yes	Yes (emergency department visits only)	Asthma is a multifactorial disease with many potential causes. ED visits don't capture asthma that is managed in a primary care setting. Need to aggregate over time and space for rate stability and confidentiality. NYS residents seeking care in other states may not be counted. This may especially impact aggregated areas that border another state.
COPD Emergency Department Visit	NYSDOH	Yes	Yes	Although there is insufficient information to determine a causal relationship, outdoor air pollution, as well as tobacco and biomass smoke exposures are considered environmental factors contributing to the development and progression of COPD. Need to aggregate over time and space for rate stability and confidentiality. State residents seeking care in other states may not be counted. This may especially impact aggregated areas that border another state.
Myocardial Infarction (MI; heart attack) hospitalization	NYSDOH	Yes	Yes	Only captures hospitalization for MI, not broader cardiovascular or heart disease that may affect more people. Need to aggregate over time and space for rate stability and confidentiality. State residents seeking care in other states may not be counted. This may especially impact aggregated areas that border another state.
Premature Deaths	NYSDOH	Yes	Yes	Need to aggregate over time and space for rate stability and confidentiality. State residents who died in other states may not be counted.
Low birthweight births	NYSDOH	Yes	Yes	Need to aggregate over time and space for rate stability and confidentiality. State residents who were born in other states may not be counted.
Population with a disability	**2019 ACS 5-year B18101**	**Yes**	**Yes**	**n/a**
Population over age 65	**2019 ACS 5-year S0101**	Yes	Yes	**n/a**
COVID-19 cases	NYSDOH Possible data sources to evaluate: NYS Statewide COVID-19 Admissions by Zip Code (https://health.data.ny.gov/Health/New-York-State-Statewide-COVID-19-Admissions-by-Zi/kmxh-hz9i)	No	No	Data not available at census tract level. Suitability for identifying DACs is unclear. Case counts for small geographies may reflect variation in test availability and testing over the course of the pandemic, adherence to other public health recommendations (e.g. vaccination, masking and social distancing), and time period represented by the data (which could reflect localized community cluster for a particular time period).
Diabetes	NYSDOH	In progress	No	Need to aggregate over time and space for rate stability and confidentiality.
Premature births	NYSDOH	No	No	Data not available at census tract level.

Indicator	Potential Data Source(s)	Data Collected and Analyzed?	Included in DAC Criteria?	Potential Limitations
Infant mortality	NYSDOH	No	No	Data not available at census tract level. Relatively small numbers raise confidentiality concerns.
Cancer incidence rates	Available data sources: National Environmental Public Health Tracking program posting subcounty cancer data in 1st half of 2022. Environmental Facilities and Cancer Mapping Application	No	No	Cancer is a common outcome. Cancers are multifactorial and represent a range of diseases. Variation in environmental-relatedness of certain cancers. Total cancer incidence reflects a mix of specific cancer types that show both a positive and negative correlation with socioeconomic status.
Heat-related emergency department visits, hospitalizations, or deaths	NYSDOH	No	No	Data not available at census tract level. Relatively small numbers mean raise confidentiality concerns and potential that data would be unstable/unreliable at small geographies.
Mental health	None found at tract level	No	No	Data unavailable at census tract level. Mental health not well-captured in NYSDOH emergency department visits & hospitalizations; would only see co-occurring ICD-9 codes. Clinic/pharmacy data may better capture mental illnesses.
Households with chronically ill people	Census microdata	No	No	Requires census microdata, which is less statistically stable than census data.
Cigarette smoking	NYSDOH	No	No	Data unavailable at census tract level.
Vector-borne illness	NYSDOH	No	No	Data unavailable at census tract level.
Air conditioning availability	NYSDOH	No	No	Data unavailable at census tract level.
Population under age 6	2019 ACS 5-year S1101	Yes	No	May not be necessary after including single-parent households (which has stronger income correlation and may be a better indicator of children's vulnerabilities to climate events).
Healthcare and Health Access				
Percent of population without health insurance	**2019 ACS 5-year B28002**	**Yes**	**Yes**	**n/a**
Doctor visits in past 12 months	None found at tract level	No	No	Data source unavailable at census tract geography level.
Percent of population without primary care physician	None found at tract level	No	No	Data source unavailable at census tract geography level.
Rented housing units	**2019 ACS 5-year B25003**	**Yes**	**Yes**	**2019 ACS 5-year B25003**
Rent as percent of income	**2019 ACS 5-year B25070**	**Yes**	**Yes**	**n/a**
Ownership costs as percent of income	2019 ACS 5-year B25092	Yes	Yes	Only applicable to homeowners; where homeownership rates are low, this may not reflect housing cost burden well.
Rate of rent increase	None found at tract level	No	No	Data source not available at the census tract geography level.
Ability to pay index	National Renewable Energy Lab (NNRREL)	Yes	No	Modeled metric with a higher weight on income than on housing costs.
Homes built before 1960	**U.S. EPA EJScreen (2017 ACS 5-year B25034)**	**Yes**	**Yes**	**Renovations/remediation in some areas affect presence and risk of lead-based paint (i.e., age of homes may no longer reflect risk). Remediation is highly regionalized so the same percentage of older homes in one area may represent less risk than in another.**
Energy cost burden (energy costs as a percentage of income) affordability	**DOE Low Income Affordability Data (LEAD) Tool**	**Yes**	**Yes**	**DOE Low Income Affordability Data (LEAD) Tool**
Manufactured and mobile homes	**2019 ACS 5-year B25024**	**Yes**	**Yes**	**n/a**

Indicator	Potential Data Source(s)	Data Collected and Analyzed?	Included in DAC Criteria?	Potential Limitations
Air conditioning availability	None found at tract level	No	No	Data source unavailable at census tract geography level.
Primary heating fuel	2019 ACS 5-year B25040	Yes	No	Census data has primary heating fuel only but not secondary, which could include woodsmoke or other fuels with negative health effects.
Sick buildings	Did not pursue	No	No	No single data source available, though several included indicators capture risk factors (e.g., mold/moisture problems, indoor air quality, proximity to remediation sites and other regulated facilities, age of home).
Power shutoffs	Electric service providers across state	No	No	Data source unavailable at census tract geography level.
Households without access to internet or without a subscription	**2019 ACS 5-year B28002**	**Yes**	**No**	**Yes**
Households without cell service	Did not pursue	No	No	Data source unavailable at census tract geography level.
Monthly cost of home internet or cell service	Did not pursue	No	No	Data source unavailable at census tract geography level.
Households without a private vehicle	2019 ACS 5-year S2504	Yes	Yes	n/a

8.2.3 Heat Vulnerability

One of the three pillars of DAC criteria mentioned in the Climate Act is *"Areas vulnerable to the impacts of climate change such as flooding, storm surges, and urban heat island effects."*

Indicators selected for the DAC criteria include numerous vulnerabilities to increased temperatures and heat waves expected from climate change, including but not limited to urban heat island effects. Sociodemographic and health vulnerabilities are included, as well as geographic and environmental attributes that could create an urban heat island effect. Table 12 lists vulnerabilities and risk factors cited in state, national, and academic literature about the urban heat island effect and heat vulnerability. The DAC criteria include indicators representing nearly all factors, either directly or indirectly (e.g., through strong correlating factors).

Together, the included indicators identify the areas at greatest risk of urban heat island effect, as well as populations most at risk of heat stress, illness, and death during heat waves and extreme temperatures.

The CJWG recognizes that increases in deaths, hospitalizations, and emergency room visits occur during heat waves. According to the NYSDOH, "A 5°F change in temperature can double a New Yorker's risk of heat-related illness." While some emergency department visits, hospitalizations, and deaths may be classified as heat-related, others may present as health problems including dehydration, confusion, dizziness, fatigue, nausea, headaches, muscle cramps, strokes, and seizures (NYC Hazard Mitigation). High-risk populations include those over age 65, infants, children, those with chronic health conditions including mental illness, and those who work outdoors or do not have air conditioning in their homes (NYCDOH Extreme Heat). Additionally, an increase in body temperature is known to bring on labor, preterm birth, or lower birth weight (NYCDOH Extreme Heat). Access to cool spaces is important in reducing the risk of heat-related illness. The NYS Office of Temporary and Disability Assistance (OTDA) provides cooling assistance to households meeting criteria related to income and documented medical conditions, among other factors.[14]

Compared to other causes of death, deaths classified as heat-related in the state are relatively rare, and for confidentiality and data reliability/stability reasons, **data cannot be displayed statewide for subcounty areas.** Because geographic risk factors and health vulnerabilities vary so much within a county, NYSDOH does not recommend including county-level rates, and instead recommends using all of the indicators in Table 12 to capture heat vulnerability. While we are unable to include health outcomes directly (heat-related hospital admissions or deaths), together these indicators highlight communities most at risk of elevated heat-related illnesses or deaths due to both geography and population vulnerabilities.

[14] https://otda.ny.gov/programs/heap/#cooling-assistance.

Table 12. Indicators Associated with Heat Vulnerability

Vulnerability	Source (referenced below)	Covered by DAC Indicators?	Notes
Sociodemographic Components of Heat Vulnerability			
Older adults	U.S. EPA Climate Change and Heat Islands	Yes – Adults over age 65	
Young children	U.S. EPA Climate Change and Heat Islands	Partial – Single-parent households	This was selected rather than presence of children in general to reflect economic and mobility vulnerabilities as well.
Low-income populations	U.S. EPA Climate Change and Heat Islands NYCDOH HVI	Yes – Percent below 80% of AMI; Percent below 100% of Federal Poverty Line	
People who work outdoors	U.S. EPA Climate Change and Heat Islands	Partial – Agricultural land	Labor and employment data by sector is not available for small geographies so we recommend using agricultural land area to approximate agricultural workers. We do not have an option for construction, highway repair, or other sectors with high outdoor exposure.
Race or ethnicity (Black and Hispanic/Latino)	NYCDOH HVI	Yes – Percent Black or African American; Percent Hispanic or Latino	In NYC, Black people die of heat-related illness at a disproportionately high rate (NYCDOH).
English proficiency and/or foreign-born	NYSDOH HVI NYSDOH Heat and Health	Yes – Percent with Limited English Proficiency (census)	
Health conditions or vulnerabilities	NYSERDA ClimAID California (Cal)EPA	Yes – Heart attacks, asthma and COPD hospitalization No – Diabetes	Underlying cardiovascular disease can interfere with a body's ability to regulate temperature in response to heat stress (ClimAID, 2014).
Disability status	CalEPA	Yes - Percent with disabilities	
Mobility constraints	NYSERDA ClimAID	Yes – Personal vehicle ownership	Access to public transportation or private vehicle associated with ability to seek alternative shelter or healthcare in extreme weather. Statewide data on access to public transportation is currently insufficient.
No air conditioning	U.S. EPA Climate Change and Heat Islands NYCDOH HVI NYSDOH Heat and Health	Partial – Low income, renters, older housing	Air conditioning penetration is not available for smaller geographies, but lower-income households, rental units and older homes are less likely to have air conditioning.
Geographic and Environmental Components of Heat Vulnerability			
High temperatures	NYSERDA ClimAID NYCDOH HVI	Yes – Number of 90+ degree days expected in 2050	
Land cover (vegetative cover vs. developed land)	NYSDOH HVI	Yes – Vegetative cover (inversely correlated with developed land), vehicle density	Several heat indices include either vegetative cover or green space. We included vegetative cover.
Housing density and developed land	NYSDOH HVI	Partial – Inversely correlated with vegetative cover, and highly correlated with	Other heat indices include developed land instead of vegetative or land cover. Several included variables are highly

		vehicle/traffic metrics, $PM_{2.5}$ and Benzene	correlated with density (and $PM_{2.5}$ and Benzene were modeled using density), so we did not include density separately.
Heat-absorptive surfaces	CalEPA	Yes – Vehicle traffic density and truck counts	The two vehicle indicators (vehicle traffic and truck counts) are correlated with roads as well.
Air pollution exacerbated by temperature increases	NYSERDA ClimAID	Partial – $PM_{2.5}$ and Benzene	Did not include ozone because it is not a consistent measure of local (on-the-ground) air quality and could be from out of state sources. Ozone concentrations are generalized over a large area and not reflective of local hotspots.

For some purposes these indicators are combined into a Heat Vulnerability Index (in the state and elsewhere), heat vulnerability is only one of multiple burdens and vulnerabilities enumerated in the Climate Act for the DAC criteria. Many of the indicators relevant for heat vulnerability are also central to representing other aspects of environmental burden, climate change risk, sociodemographic, or health vulnerabilities (addressing other aspects of DAC criteria). Therefore, the Technical Team recommended including each of these indicators individually rather than combining them into an index to specifically represent heat vulnerability. For example, income, race, and ethnicity are key criteria for identifying communities that have historically experienced discrimination and pollution burden. Additionally, the State Heat Vulnerability Index is published at the county level, and the NYC Heat Vulnerability Index at the Neighborhood Tabulation Area level, both larger than census tracts.

Heat Vulnerability Sources:

California EPA. Understanding the Urban Heat Island Index. https://calepa.ca.gov/climate/urban-heat-island-index-for-california/understanding-the-urban-heat-island-index/

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Nayak et al. (2017). Development of a heat vulnerability index for New York State. https://reader.elsevier.com/reader/sd/pii/S003335061730327X

New York City Department of Health. Extreme Heat and Your Health. https://www1.nyc.gov/site/doh/health/emergency-preparedness/emergencies-extreme-weather-heat.page

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New York State Department of Health. Heat and Health in New York State. https://www.health.ny.gov/publications/6636.pdf

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Rosenzweig, C., and W.D. Solecki, 2001: Climate change and a global city: Learning from New York. Environment, 43, no. 3, 8-18. https://pubs.giss.nasa.gov/docs/2001/2001_Rosenzweig_ro07800y.pdf

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8.3 Public Comment Summary

On December 12, 2021, the CJWG voted to release the draft DAC criteria for public comment in addition to an interactive map and list of DACs statewide. The 150-day public comment period began on March 9, 2022, and was extended through August 5, 2022. New York State held a total of 11 public hearings (four in-person hearings and 7 virtual hearings) and three public education sessions on the draft DAC criteria. Members of the public could also submit written comments through an online public comment form, email, or U.S. Mail.

Summary of Comments Received

Through the public comment period, the State received a total of 3,124 comments. The State received seven form letters, which comprised a total of 2,734 comments. The State also received 390 separate comments for a total of 397 unique comments.

After compiling the comments from the different sources, the Technical Team categorized comments by type, and for those comments that contained recommendations, the Technical team categorized by recommendation type (Tables 13 and 14). All public comments were made available to the CJWG and Technical Team, with personally identifying information removed to ensure privacy of the public.

Table 13. Type of Comments Received

Comment Type	Count
Opinion	1,692
General comment	1,047
Recommendation	286
Non-DAC Comment: Climate policy	28
Non-DAC Comment: Other	13
Non-DAC Comment	2

Absent speaker or non-substantive comment	56
Total	**3,124**

Table 14. Type of Recommendation

Recommendation Type	Count*
Additional indicators	138
Ground truthing	96
Methodology	47
Language	4
Climate policy	2
Documentation	1
n/a	2,780
Absent speaker or non-substantive comment	56
Total	**3,124**

*Two comments included multiple recommendations

8.3.1 Comment Disposition

After categorizing comments, the Technical Team then began reviewing and analyzing the 286 recommendation comments for actionable recommendations that could be considered for incorporation. This section provides an overview of that review by comment type.

Of the 286 comments, 103 of those comments came in through three different form letters, leaving 186 unique comments.

As shown in Table 14, most of the recommendations were for additional indicators for inclusion, ground truthing (e.g., commenting that a specific area should or should not be identified as a DAC), and methodological considerations.

Opinion. Comments classified as opinion expressed a positive or negative opinion about the draft DAC criteria or the process by which it was developed, but did not include any actionable recommendation that the CJWG and Technical Team could take into consideration in finalizing the DAC criteria.

Of the 1,692 comments categorized as providing an opinion about the draft DAC criteria or the process used to develop it, 1,679 came in through three different form letters, leaving 16 unique comments.

General Comment. Comments classified as a general comment expressed their thoughts or concerns related to climate change, the DAC designation, or other related concepts, such as environmental justice communities. Like comments classified as an opinion, these comments did not include actionable

recommendations that the CJWG and Technical Team could take into consideration in finalizing the DAC criteria.

Of the 1,047 comments categorized as a general comment, 952 came in through one form letter, leaving 96 unique comments.

Non-DAC Comments. Through the public comment period, the State received 43 comments that were not relevant to the DAC criteria or process and therefore could not be acted upon by the CJWG and Technical Team. These comments tended to speak more broadly about climate policy and climate goals or made statements or requests unrelated to the DAC criteria.

Absent speaker or Non-Substantive Comments. The majority of these 56 records are from people who registered to provide comments at a public hearing but then were not present or did not have a comment when called upon at the hearing.

8.3.2 Steps Taken to Address Recommendation Comments

The Technical Team further categorized the 186 unique comments with recommendations. This categorization resulted in a total of 52 methodological recommendations and 66 indicator inclusion recommendations.

The Technical Team presented these comments to the CJWG during a public meeting to obtain direction on which recommendations they wanted to assess for inclusion. Tables 15 and 16 show the methodological and indicator inclusion comment summaries respectively.

Table 15. Methodological Recommendation Summaries

Methodological Recommendation from Comment	Type of Methodological Recommendation
Consider sliding scale over percentiles	Calculation change/different calc. approach
Create threshold for a tract to be considered if it has a significant proportion of eligible households	Calculation change/different calc. approach
Further limit included tracts	Calculation change/different calc. approach
Include NYC Housing Authority housing even in non-DACs	Calculation change/different calc. approach
Make formulas simpler	Calculation change/different calc. approach
Make tool simpler	Calculation change/different calc. approach
Review scoring methodology	Calculation change/different calc. approach
Separate qualification of Indigenous lands	Calculation change/different calc. approach
Use categorical thresholds as well as geographic	Calculation change/different calc. approach
Change landfill indicator to % of area in a tract that is landfill	Change/Review/Delete Indicator
Change to 60% AMI	Change/Review/Delete Indicator
Discontinue agricultural land use	Change/Review/Delete Indicator
Discontinue Use of Benzene Concentration Variable	Change/Review/Delete Indicator
Heat related illness	Change/Review/Delete Indicator
Reassess the data sets that reflect diesel fuel	Change/Review/Delete Indicator
Re-evaluate areas where there could be double-counting	Change/Review/Delete Indicator
Re-evaluate the separation of race variables	Change/Review/Delete Indicator
Remove race indicator	Change/Review/Delete Indicator
Review driving times and homes built before 1960	Change/Review/Delete Indicator

Review inland flooding indicator	Change/Review/Delete Indicator
Review landfill methodology	Change/Review/Delete Indicator
Review rainfall methodology	Change/Review/Delete Indicator
Review vacancy and flooding variables	Change/Review/Delete Indicator
Review/Switch back to Area Median Income	Change/Review/Delete Indicator
Use both AMI and SMI	Change/Review/Delete Indicator
Include impact of burdens outside of New York	Data outside of NY
Buffer areas around census tracts for expanded burden areas	Geographic
Buffer environmental hazards	Geographic
Check town of Dover is on the map	Geographic
Check Watkins Glen trucking routes	Geographic
Create flexibility between blocks and tracts	Geographic
Expand pollution buffer beyond 1 mile	Geographic
Flexibility in boundaries of DACs so funding can still go to areas that may serve other areas	Geographic
Households or surrounding areas instead of census tracts	Geographic
Make rural areas eligible at the block level	Geographic
Proximity of burdens beyond tract borders	Geographic
Quantify burdens across geographic borders	Geographic
Review how to capture cross-tract burdens	Geographic
Review process for environmental burdens outside of tracts	Geographic
Review proportion of Southern Tier DACs	Geographic
Review rural representation	Geographic
Use block level data in rural areas	Geographic
Consider data sets that do not have statewide coverage	Include non-statewide data
Consistent state-wide measurement of PM2.5	Standardize data across state
Apply a Multiplier of 2 to the indicator Limited English Proficiency	Weighting
Apply a Multiplier of 2 to the Premature Deaths Indicator	Weighting
Apply a multiplier to population density	Weighting
Apply a multiplier to vehicle miles traveled	Weighting
Increase weights on population vulnerability	Weighting
Review the weight of agricultural variables on the map	Weighting
Weigh economic indicators higher than demographic (race)	Weighting
Weight old homes and race higher	Weighting

Table 16. Indicator Inclusion Recommendation Summary

Indicator Recommended from Comments	**Action Discussed with CJWG**
Diabetes	Actively identifying data
Noise pollution	Assess what potential indicator could/should add
Pesticide use	Assess what potential indicator could/should add
Polluted waterways	Assess what potential indicator could/should add
Proximity to airports	Assess what potential indicator could/should add

Proximity to waste transfer stations	Assess what potential indicator could/should add
Proximity to water pollution	Assess what potential indicator could/should add
Rail tracks and yards	Assess what potential indicator could/should add
Vehicle Miles Traveled (VMT) Per Capita	Assess what potential indicator could/should add
Zoning practices	Assess what potential indicator could/should add
Abandoned buildings	Assess what potential indicator could/should add
Affordable housing	Assess what potential indicator could/should add
Child poverty	Assess what potential indicator could/should add
Housing in structures with 10 or more units	Assess what potential indicator could/should add
Housing quality and safety	Assess what potential indicator could/should add
Low life expectancy	Assess what potential indicator could/should add
People under 18	Assess what potential indicator could/should add
Percent of houses with fewer rooms than people	Assess what potential indicator could/should add
Population density	Assess what potential indicator could/should add
School Free/reduced lunch recipients	Assess what potential indicator could/should add
SNAP/Food stamp recipients	Assess what potential indicator could/should add
Porous ground surfaces	Assess what potential indicator could/should add
Vehicle access	Assess what potential indicator could/should add
Area median income/median state income	Discuss/review with WG
Gentrification	Discuss/review with WG
Unintended policy vulnerabilities	Discuss/review with WG
PEJA	No action
Asthma	No action
Electromagnetic fields	No action
Heat related illnesses	No action
Landfills	No action
Potential pollution exposure	No Action
Water and air quality monitoring	No action
Cost of living	No action
Energy burden	No action
Gender identity	No action
Home prices	No action
Households without vehicles	No action
Indigenous populations	No action
Population in poverty and disabled	No action
Vacancy rates	No action
Distance to grocery stores/farmers markets	No action
Vegetation/tree canopy/green space	No action
Access to potable water	Review feasibility
Citing of industry	Review feasibility
Competitive power ventures (fracking)	Review feasibility
Illegal dumping	Review feasibility
Lead in water in schools	Review feasibility

Lead water service lines	Review feasibility
Per- and Polyfluorinated Substances (PFAs)	Review feasibility
Poor drinking water	Review feasibility
Prevalence of illegal dumping and insufficient Sanitation services	Review feasibility
Prevalence of illegal truck parking	Review feasibility
Prevalence of structural fires	Review feasibility
Re-incorporate primary heating fuel	Review feasibility
Concentration of heat-vulnerable jobs	Review feasibility
Emergency Medical Services (EMS) disabled population	Review feasibility
EN-zone	Review feasibility
High tax aid	Review feasibility
Houseless /Unsheltered people	Review feasibility
Infrastructure that serves multiple communities	Review feasibility
Percentage of public assistance cases	Review feasibility
Retain food access	Review feasibility
School closures	Review feasibility
Percentage Debt Service to Total Revenues	Review feasibility
Rainfall	Review feasibility

The Technical Team used the rubric first used to prioritize indicators for the draft criteria with the 66 recommended indicators in Table 16. Based on the rubric scores and discussion with the CJWG during public CJWG meetings, the Technical Team reduced the list of recommended indicators for inclusion to 11 potential indicators to explore further. Table 17 shows the 11 indicators considered, the use case for those indicators and status of data.

Table 17. Recommended Indicators Identified for Further Review

Indicator	Use case	Status
Diabetes	Health impact indicator	Data are being collected for this indicator.
Houseless / unsheltered people	Very high risk for climate events, extremely economically vulnerable	Public data sources available at level less specific than county (Continuum of Care/CoC level).
State High Tax aid	Potential additive income information	Exploring feasibility of obtaining data. Current income indicators likely cover this concept.
Proximity to airports	High pollution areas	Sufficiently covered through other indicators (industrial land use, low birth weight).
Zoning practices	Better capture vulnerabilities facing communities	No statewide zoning data available. Industrial land use variable covers this to some extent at the statewide level.
Access to potable water	High risk for health implications, climate events exacerbate	No statewide data.
Illegal dumping	High health implications	No statewide data.
Lead in water in schools	High health implications	No statewide data.
Lead water service lines	High health implications	No statewide data.

Abandoned buildings	Pollution and economic vulnerability	No statewide data.
Low life expectancy	Health impact indicator	Premature death data sufficiently covers this data.

The CJWG further discussed nine methodological recommendations in more depth (Table 18). The CJWG chose to make one change to the criteria based on the review of criteria methodology–the method used to combine component scores was changed from multiplying scores to adding them.

Table 18. Methodological Recommendations Discussed in Detail by CJWG

Methodological Recommendation
Further limit included tracts
Change to 60% AMI
Discontinue agricultural land use
Re-evaluate the separation of race variables
Remove race indicator
Consider data sets that do not have statewide coverage to better represent the vulnerabilities facing communities
Consistent state-wide measurement of PM2.5
Apply a multiplier to population density
Review methodology

[1] New York State Department of Environmental Conservation. Albany South End Community Air Quality Study, October 2019. https://www.dec.ny.gov/docs/air_pdf/albanysouthendreport.pdf
[2] Karner, A., Eisinger, D.S., Niemeier, D.A. Near-Roadway Air Quality: Synthesizing the Findings from Real-World Data. Environmental Science and Technology 44, 5334-5344. 2010.
[3] https://www.census.gov/newsroom/releases/archives/2010_census/cb12-95.html