Maryland
Department of
the Environment

APPENDIX H

EQUITY WITHIN RECYCLING SYSTEMS

FINAL NEEDS ASSESSMENT | MARYLAND STATEWIDE RECYCLING NEEDS ASSESSMENT

HDR

STRAUGHAN ENVIRONMENTAL

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1 Introduction

Evaluating equity and Environmental Justice (EJ) considerations are a key part of the future recycling system in the State ensures that historically underserved or overburdened populations are considered fairly and prioritized as part of the potential future EPR for packaging programs. Equity, equality, and Environmental Justice (EJ) are critical to the improvement of recycling programs and infrastructure in the State and setting challenging, but achievable performance improvement targets. Programs designed to improve equity acknowledge that needs of Regions or communities may vary, justifying the deployment of different types or levels of resources to improve local recycling systems. EJ is a component of equity specifically related to the impacts on human health and the environment so that overburdened communities are not subject to a disproportionate amount of pollution (e.g., particulate matter in the air, unsafe drinking water, illegal dumping, etc.).While it is important to hold stakeholders and Regions of the State accountable to supporting statewide goals within a specified time frame, establishing a program only designed to achieve equality may lead to a one-dimensional, or one-size-fits-all program which may not always support the needs of the State's diverse set of communities.

The following evaluates the State's diversity of geography, population centers, and recycling programs at the local and regional level. Findings are presented based on Regions, determined by the socioeconomic, geographic, and demographic characteristics that can support the development of equitable and effective EPR program targets, metrics, and reporting mechanisms.

To incorporate in the State's recycling system, the Project Team prepared a detailed analysis of the characteristics of Maryland's six regions to inform the State's strategy, providing a qualitative, visual and statistical understanding of the project community.

1.1 Background

The following analyzes demographic data with a focus on equity as it relates to recycling systems in the State. Variations in geography (e.g., roadway networks, bodies of water, and elevation changes), housing density (e.g., recycling generators per square mile), and local community priorities (e.g., health and human services needs for underserved areas) influence recycling behaviors, participation rates, and material streams. The data was collected on a county and regional basis where the 23 counties and one independent city that make up the State were divided into six regions. Although a municipality, Baltimore City has been considered similar to county jurisdictions in terms of population size and density.

The project team conducted a desktop review of available demographic data using Geographic Information Systems (GIS) tools that are described in detail in **Section 1.2**. The following data analysis identifies overburdened and underserved populations, as defined in **Section 1.3**, and assist in the development of targeted outreach strategies to expand and optimize the recycling system in the State.

1.1.1 State Environmental Justice Policies

The Maryland General Assembly has passed three bills in support of EJ efforts across the State that became effective on October 1, 2022. See **Appendix H Table 1** for legislative details.

Table 1: Maryland Environmental Justice Policies

Legislation Title	Changes Enacted
House Bill 1200 Environment – Permit Applications – Environmental Justice Screening[1] (HB1200)	Requires permit applicants who are applying for a permit which requires public notice (§ 1-601) to use a Maryland EJ Tool to develop an EJ Score. Maryland Department of the Environment (MDE) will review the EJ score which includes the facility's location and the EJ report. Defined EJ score as described in **Section 1.3**.
Senate Bill 0528 Climate Solutions Now Act of 2022[2]	Defined EJ, overburdened community, and underserved community as described in **Section 1.3**. MDE is required to consult with the Commission on Environmental Justice and Sustainable Communities (CEJSC) to: • adopt a methodology for identifying communities disproportionately affected by climate impacts; • develop specific strategies to address geographical impact concerns; • reduce greenhouse gas (GHG) emissions and build climate equity in disproportionately affected communities; and • establish goals for the percent of state funding for GHG reduction measures used for the benefit of disproportionately affected communities.
Senate Bill 0090 Department of the Environment – Supplemental Environmental Projects Database[3]	MDE is required to maintain a database of Supplemental Environmental Projects (SEPs) to be considered as part of a settlement of an enforcement action. MDE will solicit input from communities in the State that are overburdened, underserved, or otherwise disadvantaged by environmental stressors. MDE will prioritize SEPs located in the same geographic area as the alleged violation.

The progress made indicates that the State will continue to support EJ efforts across all departments.

[1] Environment – Permit Applications – Environmental Justice Screening, https://mgaleg.maryland.gov/mgawebsite/Legislation/Details/hb1200?ys=2022rs

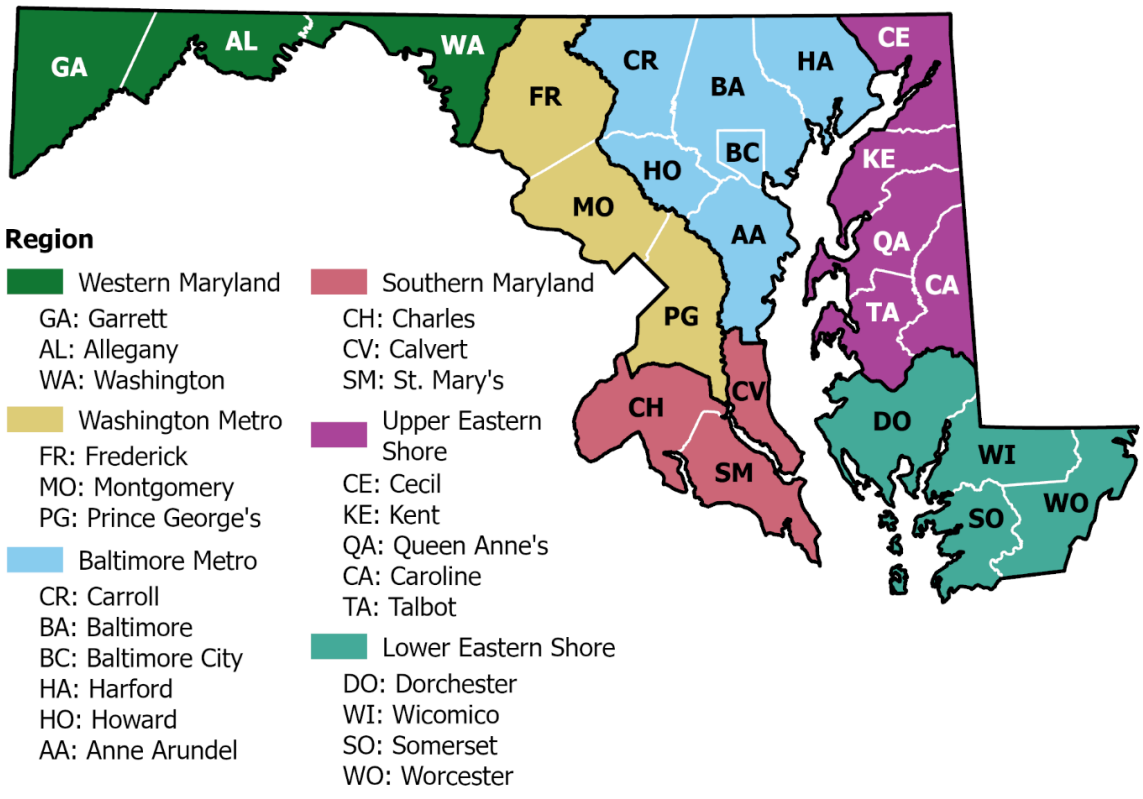
[2] Climate Solutions Now Act of 2022 Legislation, https://mgaleg.maryland.gov/mgawebsite/Legislation/Details/sb0528?ys=2022RS

[3] Department of the Environment – Supplemental Environmental Projects Database, https://mgaleg.maryland.gov/mgawebsite/Legislation/Details/sb0090?ys=2022rs

1.2 Methodology

The Maryland Department of Environment (MDE) recommended that the State be divided into six Regions to provide a geographically and socio-economically appropriate representation of the data. These county groupings were based primarily on the regions cited by the Maryland Office of Tourism, with the alteration of the region names and the counties on the Eastern Shore being divided into upper and lower sections.[4] The counties that make up each region are identified in **Appendix H Figure 1**.

Figure 1: State of Maryland Counties and Regions



The counties were analyzed for various demographic characteristics and compiled for analyses on a regional scale. Demographic data was obtained using the most recent data available from the United States Census Bureau (Census) American Community

[4] Maryland Regions, Maryland Office of Tourism, https://www.visitmaryland.org/article/maryland-regions#:~:text=Maryland%20has%20five%20regions.,and%20the%20Eastern%20Shore%20Region

Survey (ACS) 5-Year Data that incorporates places with populations over 65,000.[5] The following demographic data was obtained directly from the Census ACS data:

- Race and Ethnicity
- Language Breakdown
- Population Density
- Housing Density
- Household Types
- Disability
- Income
- Unemployment Rates

Census-designated places (CDPs) were identified by performing a spatial join of the 2022 Topologically Integrated Geographic Encoding and Referencing system (TIGER) places and the regions derived from 2022 TIGER counties. TIGER is the Census' geographic spatial data. Some CDPs overlap county and region boundaries and are counted in all counties and regions where they are located, meaning some CDPs are counted multiple times.

Population density for each county was calculated by dividing the population of the county by the land area of the county in square miles. Population data was obtained from the Census ACS data.[6] Land area was obtained from the Maryland Manual On-Line.[7]

Housing density for each county was calculated in a similar manner, where the number of single-family and multi-family housing units in a county was divided by the land area of the county in square miles. Housing data was obtained from the Census ACS data.[8] Land area was obtained from the Maryland Manual On-Line.[9]

Low-income population characteristics were obtained using the Environmental Protection Agency's (EPA) Environmental Justice Screening and Mapping Tool (EJScreen).[10] EJScreen calculates low income as the percent (%) of households where the household income is less than or equal to twice the federal poverty level which is dependent on the number of family members included in the household.[11]

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[5] American Community Survey 5-Year Data (2009-2022), United States Census Bureau, https://www.census.gov/data/developers/data-sets/acs-5year.html

[6] American Community Survey 5-Year Data (2009-2022), United States Census Bureau, https://www.census.gov/data/developers/data-sets/acs-5year.html

[7] Mayland at a Glance, Maryland State Archives, https://msa.maryland.gov/msa/mdmanual/01glance/html/area.html

[8] American Community Survey 5-Year Data (2009-2022), United States Census Bureau, https://www.census.gov/data/developers/data-sets/acs-5year.html

[9] Mayland at a Glance, Maryland State Archives, https://msa.maryland.gov/msa/mdmanual/01glance/html/area.html

[10] https://ejscreen.epa.gov/mapper/

[11] 2024 Poverty Guidelines: 48 Contiguous States (all states except Alaska and Hawaii), U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation, https://aspe.hhs.gov/sites/default/files/documents/7240229f28375f54435c5b83a3764cd1/detailed-guidelines-2024.pdf

EJScreen was also used to obtain the following characteristic data for each county:

- Linguistically Isolated (limited English speaking)
- Labor Force (unemployment rate)
- Education (less than a high school education)
- Digital Access (broadband gaps)

1.3 Key Definitions

- **Environmental Justice (EJ):** Equal protection from environmental and public health hazards for all people regardless of race, income, culture, and social status.
- **Overburdened community:** A census tract for which three or more of the following environmental health indicators are above the 75th percentile statewide:
  - Particulate matter (PM) 2.5;
  - Ozone;
  - National Air Toxics Assessment (NATA) diesel PM;
  - NATA cancer risk;
  - NATA respiratory hazard index;
  - Traffic proximity;
  - Lead paint indicator;
  - National Priorities List Superfund site proximity;
  - Risk Management Plan facility proximity;
  - Hazardous waste proximity;
  - Wastewater discharge indicator;
  - Proximity to a Concentrated Animal Feeding Operation (CAFO);
  - Percent of the population lacking broadband coverage;
  - Asthma emergency room discharges;
  - Myocardial infarction discharges;
  - Low–birth–weight infants;
  - Proximity to emitting power plants;
  - Proximity to a Toxic Release Inventory (TRI) facility;
  - Proximity to a brownfields site;
  - Proximity to mining operations; and
  - Proximity to a hazardous waste landfill.
- **Underserved community:** is defined as any census tract in which, according to the most recent U.S. Census Bureau Survey, has one of the following characteristics:

  - At least 25% of the residents qualify as low-income;
  - At least 50% of the residents identify as nonwhite; or
  - At least 15% of the residents have limited English proficiency.
- **EJ score:** is defined as an overall evaluation of an area's environment and existing environmental justice indicators, as defined by MDE in regulation, including[12]:
  - pollution burden exposure;
  - pollution burden environmental effects;
  - sensitive populations; and
  - socioeconomic factors.
- **White:** A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.
- **Black or African American:** A person having origins in any of the Black racial groups of Africa.
- **American Indian or Alaska Native:** A person having origins in any of the original peoples of North and South America (including Central America) and who maintains tribal affiliation or community attachment.
- **Asian**: A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam.
- **Native Hawaiian or Other Pacific Islander**: A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.
- **Hispanic/Latino**: People who identify their origin as Hispanic, Latino, or Spanish may be of any race.
- **Single-family housing:** Includes 1-unit detached, 1-unit attached, and 2-9 units. In recycling programs, single-family services refer to cart-based services that are often provided to housing with up to 9 residential units. In these single-family services, there is a single recycling cart for each housing unit within the building.
- **Multi-family housing:** Includes 10 or more units, mobile homes, and boats/RVs/vans. The recycling services provided to housing with 10 or more units, mobile homes, and boats/RVs/vans are typically dumpster-based. These services are referred to as multi-family services since multiple families use the same recycling receptacle.

[12] 2023 Maryland Statutes, Environment, Title 1 – Definitions; General Provisions; Enforcement, Subtitle 1 – Definitions, Section 1-101 – Definitions, https://law.justia.com/codes/maryland/environment/title-1/subtitle-1/section-1-101/

- Definitions related to the following data referenced in this report were taken from documentation describing the EPA's EJScreen tool.[13] The original source for the first three datasets is Census ACS:
    - **Limited English speaking:** Households where no member 14 years and older 1) speaks only English or 2) speaks a non-English language and speaks English very well.
    - **Unemployment rate:** Percent of a block group's population that did not have a job, made at least one active effort to find a job, and were available for work during the reporting period.
    - **Less than high school education:** The percentage of people 25 years or older in a block group who did not receive a high school diploma.
    - **Broadband gaps:** Represent block groups with households that do not have a broadband internet subscription.

The following urban, suburban, and rural categorizations were taken from the MD Department of Planning.[14] These definitions are not the same as the Waste Characterization Study designations, as those demographic assignments are meant to be consistent with the 2016 study for comparison purposes.

- **Urban:** An area that has a population equal to or greater than 3,000 per square mile.
- **Suburban:** An area that has a population equal to or more than 1,000 per square mile but less than 3,000 per square mile.
- **Rural:** An area that has a population of less than 1,000 per square mile.

2 Demographics and Equity Analysis

The six regions introduced in **Section 1.2** are further described in **Section 2.1** and general demographic data obtained using the methods described in **Section 0** are displayed on a regional and county basis in the subsections of **Section 2.1**. In **Section 2.2** through **Section 2.9,** the demographic data is displayed on a regional basis only.

Approaching recycling systems with an equity lens focuses on the accessibility and fairness of recycling collection services and education to all users of the recycling system. Keeping equity in mind when developing and expanding recycling services includes asking what can be done to address inequalities in the existing system. **Section 2.2** through **Section 2.9** will also discuss equity as it relates to each topic.

[13] Environmental Justice Mapping and Screening Tool, EJScreen Technical Documentation for Version 2.3, Environmental Protection Agency, https://www.epa.gov/system/files/documents/2024-07/ejscreen-tech-doc-version-2-3.pdf

[14] Md. Code Regs. 31.10.44.02, Maryland Department of Planning, https://casetext.com/regulation/maryland-administrative-code/title-31-maryland-insurance-administration/subtitle-10-health-insurance-general/chapter-311044-network-adequacy/section-31104402-definitions

2.1 General Region Data

General data including population, number of municipalities and CDPs was collected for each of the six regions and their counties.

According to the Census ACS data from 2022, the State has a total population of approximately 6.2 million. Nearly half of the State's population (45%) resides in the Baltimore Metro Region and over a third (37%) resides in the Washington Metro Region. The remaining population is split almost evenly among the other regions. The Washington Metro Region includes the highest number of municipalities, followed by the Upper Eastern Shore Region. The Washington Metro Region, the Baltimore Metro Region, and the Western Maryland Region, in that order, have the highest number of CDPs. Typically, areas with higher populations have more CDPs since there are more population concentrations.

The State's age demographics were broken into four categories: under 20, 20-39, 40-64, and 65+. Most of the population in each region falls in the 40-64 category (32-34%), while the 65+ population is the smallest in each region (14-22%). The Western Maryland, Lower Eastern Shore, and Upper Eastern Shore Regions have the highest percentages of 65+ populations (20%, 21%, and 22%, respectively).[15] Those three regions are also the most rural in the State.

2.1.1 Western Maryland Region

The Western Maryland Region consists of the three western counties touching the Pennsylvania and West Virginia borders: Garrett County, Allegany County and Washington County. The Region contains the State's highest elevation hailing from the Appalachian Mountains. Backbone Mountain, in Garrett County, is the State's highest point at 3,360 feet and is part of the eastern continental divide. This area hosts tourism throughout the year with its natural beauty, outdoor recreation, historical places, and the cultural arts. Populations densities are higher along major interstates and the historical Chesapeake and Ohio (C&O) Canal.

The Western Maryland Region has a population of 251,662, which is approximately 4% of the State's total population. Washington County is the Region's largest county by population and represents 2.5% of the state's population. There are 24 municipalities and 123 CDPs within the Western Maryland Region. Population, municipality and CDP data are broken down by county in **Table 2.**

Table 2: Western Maryland Region Population and Municipality Data

Western Maryland Region County	Population	Percent of Maryland Population	Number of Municipalities	Number of Census-designated Places
Garrett County	28,856	0.5%	8	15

[15] American Community Survey 5-Year Data (2009-2022), United States Census Bureau, https://www.census.gov/data/developers/data-sets/acs-5year.html

Western Maryland Region County	Population	Percent of Maryland Population	Number of Municipalities	Number of Census-designated Places
Allegany County	68,161	1.1%	7	44
Washington County	154,645	2.5%	9	61
Total	251,662	4.1%	24	120

2.1.2 Washington Metro Region

The Washington Metro Region consists of three counties touching the Pennsylvania and/or Virginia borders: Frederick County, Montgomery County, and Prince George's County. The Appalachian Mountains also run through western side of this region, specifically the Catoctin Mountains in Frederick County. The southern portion of this Region (Montgomery County and Prince George's County) is the Piedmont Plateau area consisting of rolling hills and rivers. With the proximity to the nation's capital, this region offers many economic opportunities as well as access to other goods and services. There are two major airports connected by a public transit system and major interstates.

The Washington Metro Region has a population of 2,287,928, which is approximately 37% of the State's total population. Most the Region's population resides in Montgomery and Prince George's Counties. There are 58 municipalities and 196 CDPs within the Region. Population, municipality and CDP data are broken down by county in **Table 3**.

Table 3: Washington Metro Region Population and Municipality Data

Washington Metro Region County	Population	Percent of Maryland Population	Number of Municipalities	Number of Census-designated Places
Frederick County	273,829	4.4%	12	28
Montgomery County	1,056,910	17.2%	19	59
Prince George's County	957,189	15.5%	27	85
Total	2,287,928	37.1%	58	172

2.1.3 Baltimore Metro Region

The Baltimore Metro Region consists of six central counties touching the Pennsylvania and Chesapeake Bay borders: Harford County, Baltimore County, Carroll County, Howard County, Baltimore City, and Anne Arundel County. This Region is a combination of the Piedmont Plateau and the Atlantic Coastal Plain topographies consisting of rolling hills and bay tributaries. With the area considered the heart of Maryland, including the state capital located in Anne Arundel County, it offers many diverse economic

opportunities. For instance, The Port of Baltimore is located within Baltimore City, and supports 15,330 direct jobs and 139,180 jobs[16].

The Baltimore Metro Region has the highest population at 2,789,689, which is approximately 45% of the State's total population. There are 13 municipalities, not including Baltimore City, and 157 CDPs within the Region. Population, municipality and CDP data are broken down by county in **Table 4**.

Table 4: Baltimore Metro Region Population and Municipality Data

Baltimore Metro Region County	Population	Percent of Maryland Population	Number of Municipalities	Number of Census-designated Places
Harford County	261,059	4.2%	3	16
Baltimore County	850,737	13.8%	0	32
Carroll County	173,225	2.8%	8	9
Howard County	332,011	5.4%	0	11
Baltimore City	584,548	9.5%	0	1
Anne Arundel County	588,109	9.5%	2	32
Total	2,789,689	45.3%	13	101

2.1.4 Southern Maryland Region

The Southern Maryland Region consists of the three central counties surrounded by the Potomac River and Chesapeake Bay: Charles County, Calvert County, and St. Mary's County. This Region consists of Atlantic Coastal Plain topography.

The Southern Maryland Region has a population of 374,093, which is approximately 6% of the State's total population. There are 6 municipalities and 52 CDPs within the Region. Population, municipality and CDP data are broken down by county in **Table 5.**

Table 5: Southern Maryland Region Population and Municipality Data

Southern Maryland Region County	Population	Percent of Maryland Population	Number of Municipalities	Number of Census-designated Places
Charles County	167,035	2.7%	3	14
Calvert County	93,244	1.5%	2	15
St. Mary's County	113,814	1.8%	1	11
Total	374,093	6.1%	6	40

2.1.5 Upper Eastern Shore Region

The Upper Eastern Shore Region consists of the five northeastern counties touching the Pennsylvania and/or Delaware borders on the east side of the Chesapeake Bay: Talbot

[16] Maryland at a Glance, Maryland State Archives, October 29, 2024, https://msa.maryland.gov/msa/mdmanual/01glance/html/port.html

County, Caroline County, Queen Anne's County, Kent County, and Cecil County. This is one of the least populated Regions in the state. This Region consists of Atlantic Coastal Plain topography. The rural area has ties to Chesapeake Bay. Not only does it offer tourism through recreational fishing but it also offers many historical spots and opportunities for outdoor recreation.

The Upper Eastern Shore Region has a population of 244,464, which is approximately 4% of the State's total population. There are 36 municipalities and 63 CDPs within the Region. Population, municipality and CDP data are broken down by county in **Table 6.**

Table 6: Upper Eastern Shore Region Population and Municipality Data

Upper Eastern Shore Region County	Population	Percent of Maryland Population	Number of Municipalities	Number of Census-designated Places
Talbot County	37,663	0.6%	5	7
Caroline County	33,320	0.5%	10	13
Queen Anne's County	50,316	0.8%	8	15
Kent County	19,289	0.3%	5	14
Cecil County	103,876	1.7%	8	8
Total	244,464	4.0%	36	57

2.1.6 Lower Eastern Shore Region

The Lower Eastern Shore Region consists of the four southeastern counties touching the borders of Delaware, Virginia, Chesapeake Bay and the Atlantic Ocean: Dorchester County, Wicomico County, Somerset County, and Worchester County. This is the least populated region in the state. This Region consists of Atlantic Coastal Plain topography. This rural area is similar to the Upper Eastern Shore Region; however, it also offers a popular tourist destination in the warmer months.

The Lower Eastern Shore Region has the lowest population at 213,871, which is approximately 3.5% of the State's total population. There are 23 municipalities and 61 CDPs within the Region. Population, municipality and CDP data are broken down by county in **Table 7**.

Table 7: Lower Eastern Shore Region Population and Municipality Data

Lower Eastern Shore Region County	Population	Percent of Maryland Population	Number of Municipalities	Number of Census-designated Places
Dorchester County	32,557	0.5%	9	14
Wicomico County	103,815	1.7%	8	19
Somerset County	24,672	0.4%	2	11
Worcester County	52,827	0.9%	4	11
Total	213,871	3.5%	23	55

2.2 Population Density

Most of the State's population resides in the Washington Metro and Baltimore Metro Regions as discussed in the subsections of **Section 2.1**. The highest population density occurs in those same regions. **Table 8** displays the population count per square land mile for each region.

Table 8: Population Density by Region

Region	Population Density
Western Maryland	165
Washington Metro	1,400
Baltimore Metro	1,251
Southern Maryland	364
Upper Eastern Shore	154
Lower Eastern Shore	126

The Washington Metro and Baltimore Metro Regions are the most densely populated due to their proximity to or incorporation of major cities. Within the Washington Metro Region, the counties adjacent to Washington, D.C., Montgomery and Prince George's, have population densities of 2,151 and 1,983 population counts per square mile, respectively. In the Baltimore Metro Region, Baltimore City's population density is 7,221 and the counties surrounding Baltimore City, Baltimore, Howard, and Anne Arundel, have population densities of 1,421, 1,324, and 1,417, respectively. The counties in the Western Maryland, Southern Maryland, and Eastern Shore Regions have smaller populations and thus lower population densities.

Table 9 shows the percentage of the population that is rural, suburban, and urban for each region.[17] In the Washington Metro and Baltimore Metro Regions, most of the population is considered urban. In the Western Maryland, Southern Maryland, and Upper Eastern Shore Regions, half or more of the population is rural. The Lower Eastern Shore region has a more equal distribution of the population between rural, suburban, and urban.

Table 9: Rural, Suburban, and Urban Population by Region

Region	Rural	Suburban	Urban
Western Maryland	49.3%	16.8%	33.9%
Washington Metro	13.5%	15.7%	70.9%
Baltimore Metro	19.2%	17.3%	63.4%

[17] 2020 Census Population – Census Blocks, United State Census Bureau, https://data.census.gov/table/DECENNIALPL2020.P1?t=Populations%20and%20People&g=040XX00US24$1000000

Region	Rural	Suburban	Urban
Southern Maryland	50.0%	22.5%	27.5%
Upper Eastern Shore	55.1%	21.1%	23.8%
Lower Eastern Shore	42.6%	22.5%	34.9%

From an equity perspective, urban regions with higher population density require more recycling infrastructure for an increased production volume. More curbside and/or drop-off locations are needed. With more people comes the increased chance of contamination, making education particularly important. Rural regions with lower population densities often require more access to recycling infrastructure and/or more recycling transportation capacity. It may make sense to have fewer curbside services and more drop-off locations in rural areas with less people. Recycling programming also needs to consider the challenges related to living in the mountains or on the water, where there may be less access to recycling information and services.

2.3 Race and Ethnicity

Most of the State identifies as white except for the Washington Metro Region, where most of the population identifies as Black. The lowest represented race across all six regions is Pacific Islander. **Table 10** displays the race and ethnicity data for each region as a percentage of the population.

Table 10: Race and Ethnicity Identification Data by Region

Region	White	Black	Native	Asian	Pacific Islander	Other	Two or More Races	Hispanic/ Latino
Western Maryland	81.3%	8.9%	0.1%	1.4%	0.1%	0.2%	3.5%	4.5%
Washington Metro	32.3%	34.8%	0.2%	9.3%	0.0%	0.7%	3.8%	18.9%
Baltimore Metro	53.8%	29.2%	0.1%	5.9%	0.0%	0.5%	3.9%	6.5%
Southern Maryland	56.4%	28.9%	0.2%	2.7%	0.0%	0.4%	5.5%	5.9%
Upper Eastern Shore	80.2%	8.8%	0.1%	1.1%	0.0%	0.5%	3.6%	5.6%
Lower Eastern Shore	64.3%	23.9%	0.1%	2.0%	0.0%	0.3%	4.2%	5.1%

Figure 2 displays the data presented in **Table 10** as a stacked bar chart to visualize the race and ethnicity composition of each region.

Figure 2: Race and Ethnicity by Region

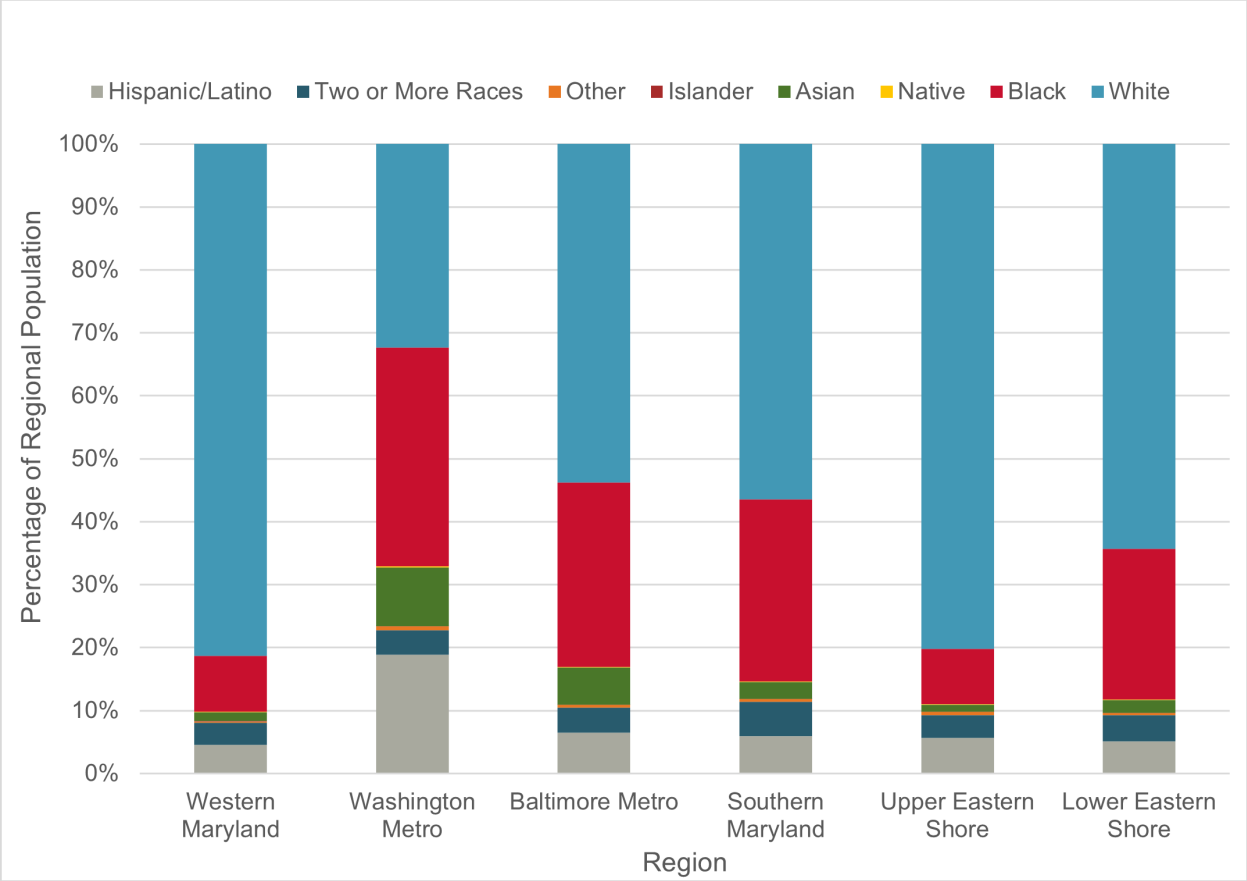


Figure 2 shows that the top three race and ethnicity identities across the six regions are:

- White (average 61.4% across the six regions)
- Black (average 22.4% across the six regions)
- Hispanic/Latino (average 7.8% across the six regions)

2.4 English Proficiency

The Census ACS data revealed that the most common spoken language across the State is English, at 87.3% across the six regions. **Table 11** displays the breakdown of languages spoken within the six regions, as well as the percentage of the population categorized as linguistically isolated. The limited English-speaking data was acquired from the EPA EJScreen tool, but its original source is Census ACS.[18]

[18] EJScreen, Environmental Protection Agency, https://ejscreen.epa.gov/mapper/

Table 11: Language Breakdown by Region

Region	English	Spanish	Other Indo-European	Asian and Pacific Island	Other	Limited English Speaking
Western Maryland	93.7%	3.4%	1.6%	0.7%	0.5%	0.6%
Washington Metro	66.7%	16.3%	6.9%	5.7%	4.5%	5.1%
Baltimore Metro	86.4%	4.5%	3.8%	3.2%	2.1%	1.8%
Southern Maryland	92.3%	3.4%	2.0%	1.6%	0.7%	0.8%
Upper Eastern Shore	93.2%	4.0%	1.5%	0.8%	0.5%	1.4%
Lower Eastern Shore	91.3%	3.8%	3.0%	1.3%	0.6%	1.4%

The Washington Metro Region has the lowest percentage of English speakers of the six regions at 66.7%, and the highest percentage of Spanish speakers of the six (6) regions at 16.3%. The Washington Metro Region also had the highest percentages for Black- and Hispanic/Latino-identifying populations of the six regions. **Figure 3** displays the data presented in **Table 11** as a stacked bar chart to visualize the language breakdown of each region.

Figure 3: Language Breakdown by Region

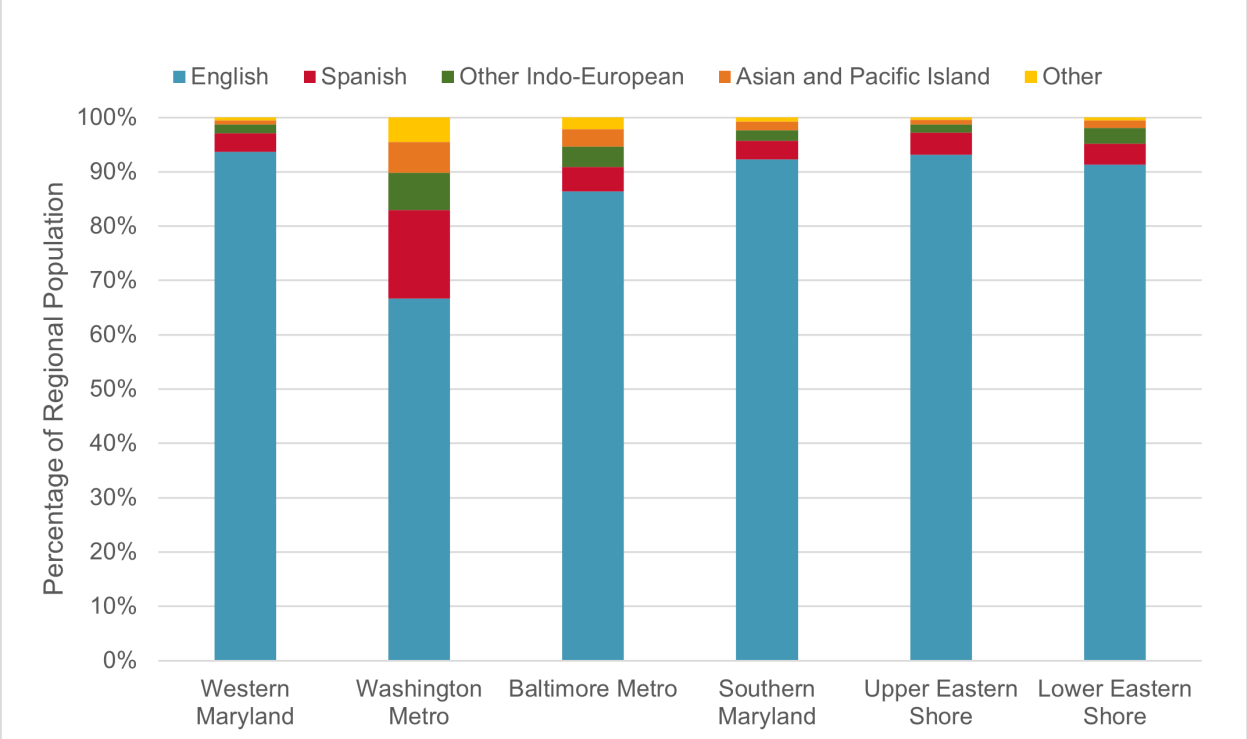


Figure 3 shows the difference in percentage of the population that speaks English in the Washington Metro Region in comparison to the other regions.

To make access to recycling education materials more equitable and effective, they should be provided in multiple languages, depending on the region. For instance, since

the Washington Metro Region has the highest percentages of Spanish speakers and limited English-speaking populations, recycling education materials should be translated into Spanish. This would likely increase program participation and reduce contamination.

2.5 Household Data

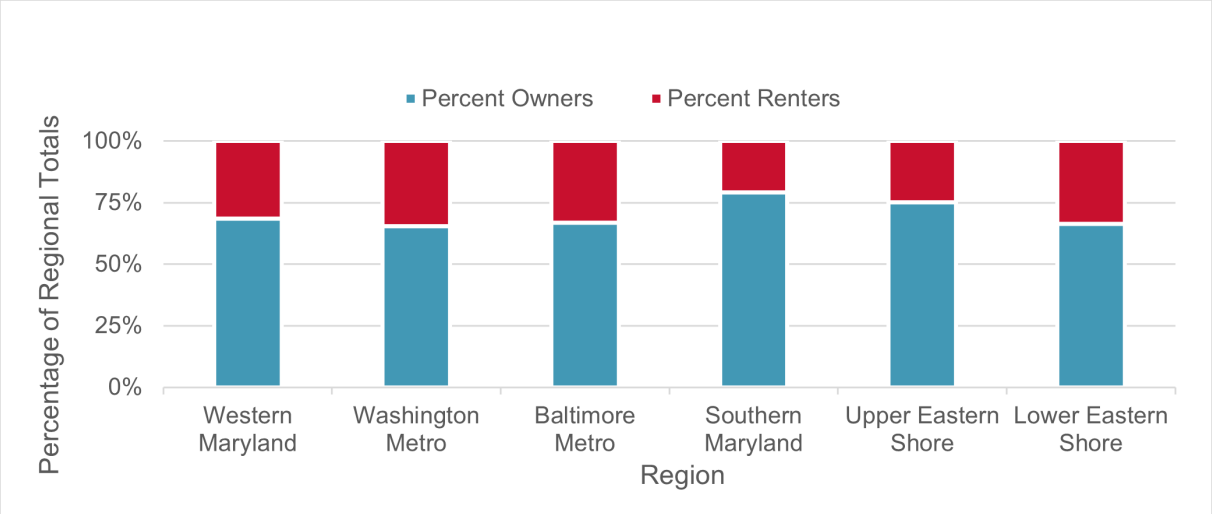
There are over 2 million households across the State, with an average occupancy rate of 86.8%. 70.3% of residents statewide own their homes, while 29.7% are renters. **Table 12** displays the number of households, occupancy rates, and the percentages of owners and renters for each region.

Table 12: Household Data by Region

Region	Total Households	Total Occupied Households	Percent Occupancy	Percent Owners	Percent Renters
Western Maryland	115,084	98,961	86.0%	68.6%	31.4%
Washington Metro	867,036	826,232	95.3%	65.6%	34.4%
Baltimore Metro	1,168,973	1,078,917	92.3%	66.8%	33.2%
Southern Maryland	143,776	133,700	93.0%	79.1%	20.9%
Upper Eastern Shore	108,761	95,347	87.7%	75.2%	24.8%
Lower Eastern Shore	127,445	84,967	66.7%	66.5%	33.5%

In line with the population data previously analyzed for the Washington Metro and Baltimore Metro Regions, those regions have the highest numbers of households and the highest occupancy rates. The Lower Eastern Shore Region has the lowest occupancy rate of the six regions. This could be due to the tourism economy and seasonal trends in visiting populations. Housing ownership percentages by region are displayed in **Figure 4**.

Figure 4: Housing Ownership by Region



The Southern Maryland and Upper Eastern Shore Regions have the highest percentages of owners of the six regions, due to lower housing prices compared to other regions. Washington Metro and Baltimore Metro Regions have low percentages of ownership and high percents of renters since the cost of living is higher in and around Washington D.C and Baltimore City. The Lower Eastern Shore Region also has a lower percentage of owners and a higher percentage of renters due to the tourism industry. Household types were also reviewed. **Table 13** displays the household types across the six regions.

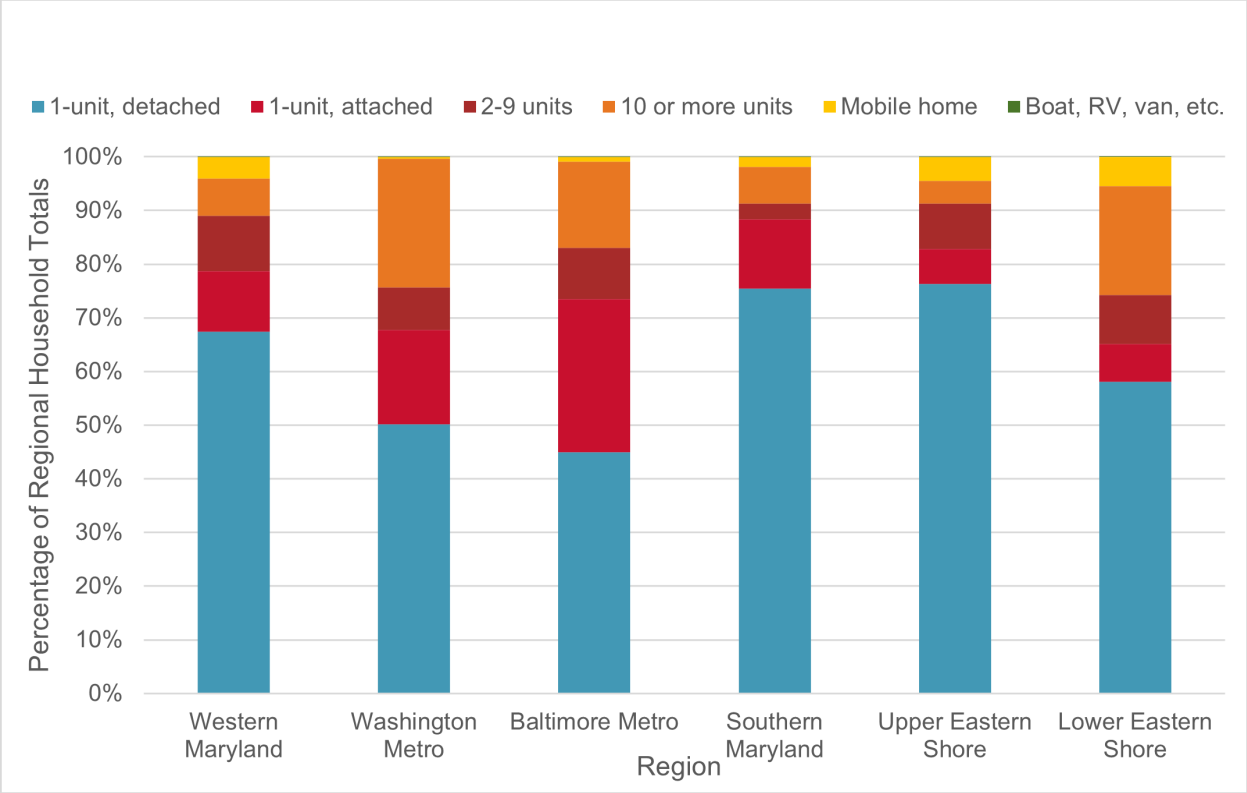
Table 13: Household Types by Region

Region	1-unit, detached	1-unit, attached	2-9 units	10 or more units	Mobile home	Boat, RV, van, etc.
Western Maryland	77,546	13,091	11,752	8,065	4,599	31
Washington Metro	435,026	152,080	68,964	207,501	3,276	189
Baltimore Metro	524,997	333,998	112,145	187,084	10,285	464
Southern Maryland	108,529	18,576	4,203	9,747	2,668	53
Upper Eastern Shore	82,992	7,122	9,230	4,608	4,775	34
Lower Eastern Shore	73,994	9,074	11,567	25,909	6,880	21

Values shown in Appendix H Table 13 represent the number of households classified in each household type.

Figure 5 displays the percentage of each household type by region.

Figure 5: Household Types by Region



The most common household type is 1-unit detached housing while the least common household type is a boat, RV, van or similar alternative housing unit. Most multi-unit buildings (more than nine units) had 20 or more units. The Washington Metro and Baltimore Metro Regions have larger proportions of multi-family housing units due to their higher populations. Those two regions also have higher percentages of 1-unit attached and over 2-unit housing, which would be in line with their higher population densities. With Southern and Upper Eastern Shore being rural areas with less population density, it allows for more 1-unit, detached homes versus the urban areas. The Washington Metro and Lower Eastern Shore Regions have the highest percentages of 10 or more-unit housing, due to it being a tourism destination.

The percentages of household types will have an impact on the recycling collection systems in the region. Regions with more single-family households will require more cart-based curbside services, whereas regions with more multi-family housing will need more dumpster-based services.

2.6 Housing Density

Single-family housing includes 1-unit detached, 1-unit attached, and 2-9 units. Multi-family housing includes 10 or more units, mobile homes, and boats/RVs/vans. **Table 14** shows the number of single-family and multi-family housing per square land mile for each region.

Table 14: Housing Density by Region

Region	Density of Single-Family	Density of Multi-Family
Western Maryland	67	8
Washington Metro	401	129
Baltimore Metro	436	89
Southern Maryland	128	12
Upper Eastern Shore	63	6
Lower Eastern Shore	56	19

There is on average 192 single-family housing units per square land mile and 42 multi-family housing units per square land mile across the State. Housing density follows a similar pattern as population density for the six regions where the Washington Metro and Baltimore Metro Regions have the highest densities for both single-family and multi-family housing. The Upper Eastern Shore Region has the lowest average housing density between single-family and multi-family housing units of the six regions. The Lower Eastern Shore Region has the highest ratio of single-family and multi-family housing units with almost 3 single-family housing units for one multi-family housing unit.

Given the variations in infrastructure types at multi-family properties, there may be an inequitable impact in terms of cost to implement recycling, where requirements for multi-family recycling would increase costs for property managers and may be passed through to residents.

2.7 Economic Characteristics

Economic characteristics including income and unemployment data were compiled for each region in **Table 15,** where the income and unemployment data are averages of the counties within each region.

Table 15: Economic Status by Region

Region	Number of Households	Income per Capita	Low-Income Population	Unemployment Rate
Western Maryland	98,961	$35,667	31%	5.5%
Washington Metro	826,232	$53,043	18%	5.1%
Baltimore Metro	1,078,917	$50,354	20%	4.5%
Southern Maryland	133,700	$50,590	15%	3.9%
Upper Eastern Shore	95,347	$44,933	25%	3.9%
Lower Eastern Shore	84,967	$35,638	33%	6.5%

The Lower Eastern Shore Region has the lowest income per capita, the highest low-income population, and the highest unemployment rate of the regions. This is followed by the Western Maryland Region, which has a similarly low income per capita and high low-income population and unemployment rate. The Washington Metro Region has the highest income per capita, but middling low-income population and unemployment rate compared to the other regions in the State.

2.8 Disability Characteristics

Disability characteristics were obtained using EPA's EJScreen, which considers the following disability types:

- Hearing difficulty
- Vision difficulty
- Cognitive difficulty
- Ambulatory difficulty
- Self-care difficulty
- Independent living difficulty

Approximately 12.7% of the State population identifies as disabled. **Table 16** displays the percentage of population that identifies as disabled across the six regions.

Table 16: Disabled Population by Region

Region	Percent Disabled
Western Maryland	16.6%
Washington Metro	9.4%
Baltimore Metro	12.1%
Southern Maryland	10.4%
Upper Eastern Shore	13.3%
Lower Eastern Shore	14.1%

It is unclear which disability is most prevalent amongst the disabled population in each region since respondents only need to report one of the six difficulties to be considered in EJScreen.[19] This is a data limitation of the EJ Screen.

The Western Maryland Region has the highest percentage of disabled people at 16.6% while the Washington Metro Region has the lowest percentage at 9.4%. Western

[19] EJScreen Map Descriptions, Environmental Protection Agency, https://www.epa.gov/ejscreen/ejscreen-map-descriptions

Maryland is part of the Appalachian region, which has a higher percentage of residents with disabilities compared to the national average.[20]

The specific disabilities prevalent in a region or community will need to be better understood to remove barriers to recycling for those populations.

2.9 Education and Digital Access

Two additional demographic factors were reviewed with a focus on EJ, education and digital access.

- Percent of the population with less than a high school education (education)
- Percent of the population with gaps in broadband (lack of digital access)

The original source of the education data is from Census ACS.[21] Both datasets were acquired from the EPA EJScreen Tool.[22] **Table 17** displays the data as a percent of the population by region. An average 9.1% of the State's population has less than a high school education and an average of 11.8% of the State's population experiences gaps in broadband connectivity.

Table 17: Education and Data Access Data by Region

Region	Education	Lack of Digital Access
Western Maryland	10.2%	16.3%
Washington Metro	9.4%	7.0%
Baltimore Metro	7.4%	9.3%
Southern Maryland	6.4%	9.0%
Upper Eastern Shore	9.6%	14.4%
Lower Eastern Shore	11.4%	14.8%

The Lower Eastern Shore has the highest percentage of the population that has less than a high school education which could be due to less educational opportunities in the region. In regions with higher percentages of populations with less than a high school education, such as Lower Eastern Shore and Western Maryland, creating educational materials at a middle school level could remove barriers to understanding recycling education.

The Western Maryland Region has the highest percentage of the population experiencing gaps in broadband which could be due to the topography of the Appalachian Mountains and distance from metropolitan areas. The Eastern Shore

[20] The Appalachian Region: A Data Overview From The 2017-2021 American Community Survey, Appalachian Regional Commission, March 2024, https://www.arc.gov/wp-content/uploads/2023/05/PRB_ARC_Chartbook_ACS_2017-2021_FINAL_2023-06.pdf

[21] American Community Survey 5-Year Data (2009-2022), United States Census Bureau, https://www.census.gov/data/developers/data-sets/acs-5year.html

[22] EJScreen, Environmental Protection Agency, https://ejscreen.epa.gov/mapper/

Regions also have high percentages of the population experiencing gaps in broadband which could also be due to the topography and distance from metropolitan areas. The percentage of the population experiencing gaps in broadband access is lower in the densely populated Washington Metro and Baltimore Metro Regions.

Regions with gaps in broadband connectivity, such as the Western and Eastern Shores Regions, may not be able to reach as many people via online educational advertisements or campaigns. Other forms of educational outreach should be considered.

3 Environmental Justice Initiatives

The State has supported EJ efforts through the Commission on Environmental Justice & Sustainable Communities (CEJSC), which was established in January 2001. The twenty-member group consists of representatives from multiple state agencies and local government organizations who are responsible for providing recommendations on EJ and analyzing the effectiveness of laws and policies to address EJ issues for the State government.

Multiple policies have since been passed in support of EJ which are further described in **Section 1.1.1**. MDE has developed multiple resources on EJ that provides users with access to various GIS databases, tools, inventories and registries consisting of educational material to help users make informed decisions. These resources are further discussed in **Section 3.1**.

3.1 Environmental Justice Screening Tools

This assessment used two EJ screening tools to aid in its analysis. One was the State's MDE EJ Screening Tool that was written into HB1200 and the other was EPA's EJScreen tool.[23,24] Both tools aided in the understanding of environmental justice indicators per county and region.

3.1.1 MDE EJ Screening Tool

MDE's EJ Screening Tool was developed to provide users with data that could be used to inform decisions on siting, permitting, enforcement, and infrastructure improvements. The tool allows users to identify potentially overburdened or underserved communities at the census tract level. There are many layers available for users to turn on or off, allowing users to overlay multiple layers if necessary. Some of the layers have sublayers as well, allowing users to conduct a more detailed analysis if necessary.

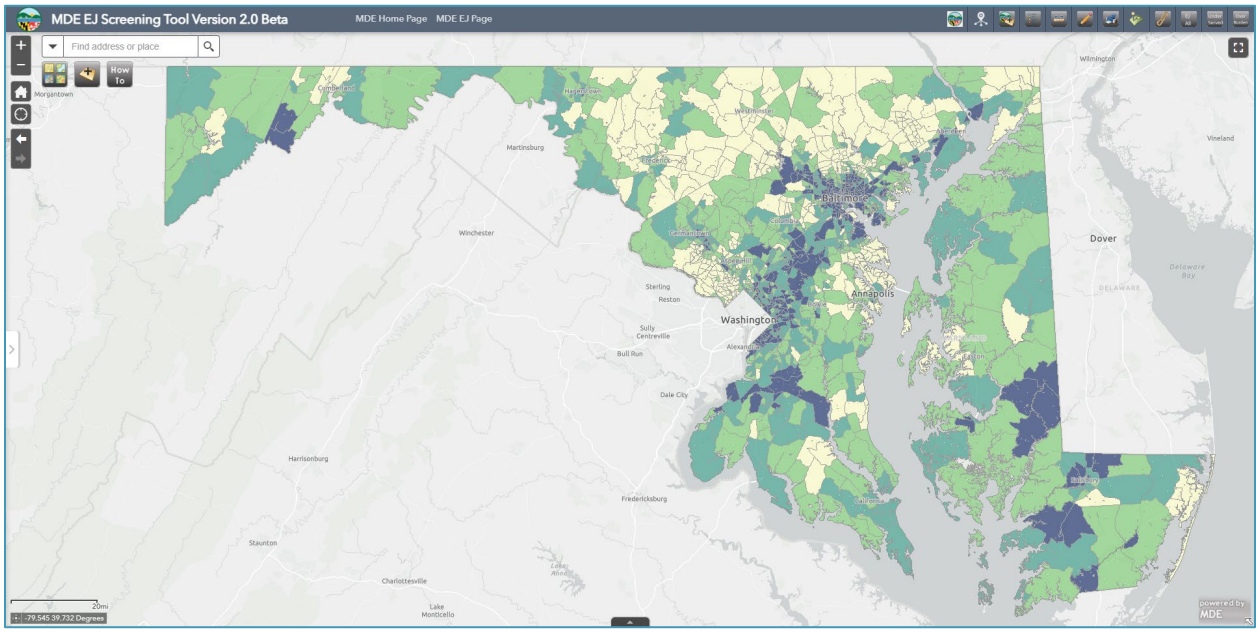
Figure 6 displays the *MDE EJ Score* layer at the census tract level in the MDE EJ Screening Tool. Darker colors indicate scores that are in a higher percentile, or areas that are more overburdened and/or underserved, and lighter colors indicate scores that are in a lower percentile, or areas that are less overburdened and/or underserved. Areas

[23] MDE EJ Screening Tool Version 2.0 Beta, Maryland Department of the Environment https://mdewin64.mde.state.md.us/EJ/

[24] EPA EJScreen, Environmental Protection Agency, https://ejscreen.epa.gov/mapper/

in yellow have an EJ score in the 0-24.9th percentile, green shows areas in the 25-49.9th percentile, blue-green areas are in the 50-74.9th percentile, and areas shown in dark blue are in the 75-100th percentile. Detailed definitions for overburdened and underserved are provided in **Section 1.3**, but generally, a higher percentile score indicates that a higher percent of the population is low-income, non-white, and/or has limited English proficiency (underserved) and/or there are more environmental or health hazards (overburdened).

Figure 6: MDE EJ Score layer on the MDE EJ Screening Tool



MDE calculates an EJ Score (defined in **Section 1.3**) using four EJ indicators based on census and health data, listed below. The environmental health indicators within the definition of an overburdened community are divided into and used to calculate the first three EJ indicator scores: pollution burden exposure, pollution burden environmental effects, and sensitive populations. The definition of an underserved community is used to calculate the fourth EJ indicator score: socioeconomic/demographic. The below list details which overburdened environmental health indicators are used to calculate which EJ indicators:

- Pollution burden exposure
  - Particulate matter (PM) 2.5
  - Ozone
  - National Air Toxic Assessment (NATA) diesel PM
  - NATA cancer risk
  - NATA respiratory hazard index
  - Traffic proximity
  - Proximity to a toxic release inventory (TRI) facility
  - Proximity to a hazardous waste landfill
- Pollution burden environmental effects

  - Lead paint indicator
  - Risk management plan facility proximity
  - Hazardous waste proximity
  - National priorities list superfund site proximity
  - Wastewater discharge indicator
  - Proximity to a brownfields site
  - Proximity to emitting power plants
  - Proximity to a concentrated animal feeding operation (CAFO)
  - Proximity to mining operations
- Sensitive populations
  - Low-birth-weight infants
  - Asthma emergency room discharges
  - Myocardial infarction discharges
  - Percent of the population lacking broadband coverage
- Socioeconomic/Demographic indicators

It's possible that some areas may appear as overburdened for sensitive populations due to the area's proximity to a hospital, since the indicators collected to calculate sensitive populations scores were provided by hospitals instead of census data. **Table 17** shows the EJ score percentiles for each county and region.

Table 18: MDE EJ Score percentile by county and region

Region/County	EJ Score Percentile
Western Maryland	**40**
Garrett County	39
Allegany County	37
Washington County	43
Washington Metro	**44**
Frederick County	28
Montgomery County	38
Prince George's County	67
Baltimore Metro	**44**
Harford County	31
Baltimore County	46

Region/County	EJ Score Percentile
Carroll County	17
Howard County	44
Baltimore City	83
Anne Arundel County	42
Southern Maryland	**46**
Charles County	58
Calvert County	36
St. Mary's County	45
Upper Eastern Shore	**45**
Talbot County	40
Caroline County	53
Queen Anne's County	39
Kent County	61
Cecil County	32
Lower Eastern Shore	**55**
Dorchester County	67
Wicomico County	61
Somerset County	65
Worcester County	26

Although the regional EJ scores are similar, there is variation not only in the scores of individual counties, but also in terms of what factors determined the scores and what that means for recycling access equitability. Higher EJ scores in urban versus rural areas have different meanings and needs. Higher scores in urban areas tend to be indicative of higher diversity and larger nonwhite populations that are affected by urban pollution. Higher scores in rural areas tend to signify low-income and unemployed populations affected by challenging geography and less access to infrastructure. Thus, there are different ways to increase equitable outcomes for recycling in urban versus rural areas.

On a county level, City of Baltimore has the highest percentile EJ score (83rd percentile), followed by several counties with scores in the 60th percentiles: Prince George's (67th), Dorchester (67th), Somerset (65th), Kent (61st), and Wicomico (61st). On a regional level, the Lower Eastern Shore Region has the highest percentile score of the State (55th percentile) with most of the counties in the region having scores in the 60th percentiles. The EJ scores within each region are further discussed in the paragraphs below.

Except for an area in southwestern Allegany County, the Western Maryland Region generally has median EJ scores. On a county level, the counties have EJ scores in the high 30th and low 40th percentiles. Since the region has a population with the highest percentages of white and the lowest percentages of limited English-speaking people in the State, most census tracts are in the lower percentiles of the underserved indicator with slight increases in and around Hagerstown. About half of the region's population is considered rural, with urban areas along major interstates and the historic C&O Canal making up a third of the region's population. Some rural parts of the region have higher overburdened scores, specifically regarding the pollution burden environmental effects and sensitive populations indicators. The census tracts that have the highest EJ scores in the region, in southwestern Allegany County, are considered to have more challenges providing widespread recycling collection service because they are located in mountainous areas, so there is less access to infrastructure. The presence of a landfill in that area also increases the population's exposure to potential pollution. From a recycling equitability view, overburdened populations in this region need more access to recycling infrastructure and programming that considers the challenges of rural and mountainous geography. Further, new recycling facilities in the region should be designed to prevent pollution and environmental and health impacts on residents.

In the Washington Metro Region, the urban census tracts surrounding Washington D.C. and a rural area in southern Prince George's County have the highest EJ scores in the region. The urban areas around Washington D.C. have higher underserved scores, relating to the region having the highest percentages of non-white and limited English-speaking populations in the State. These urban areas also have higher pollution burden exposure and pollution burden environmental effects indicator scores, making them overburdened, due to the higher pollution exposure risks that are common in and around large metropolitan areas. The rural areas on the western and southern borders of the region also have higher overburdened pollution burden environmental effects indicator scores, due to a higher risk of exposure to pollution from farming practices in western Frederick and Montgomery Counties and mining in southern Prince George's County.

In the Baltimore Metro Region, urban areas in and around Baltimore City and the I-95 corridor have EJ scores in the highest percentiles. Baltimore City has the highest percentile score in the State. In and around Baltimore City, there are areas with higher underserved populations, due to higher nonwhite populations in the region. These same urban areas also have higher overburdened scores, due to higher urban pollution risks.

The Washington Metro and Baltimore Metro Regions have well-developed existing recycling collection infrastructure. Therefore, when considering recycling access equitability in these regions, recycling operations in underserved and overburdened areas should focus on increasing participation in existing programs while also improving current facilities and processes to emit less pollutants and increase safety for the surrounding populations.

In general, most areas in the Southern Maryland region have median EJ scores. However, there are some areas in the northwestern part of the Southern Maryland region, on the outskirts of Washington D.C. in Charles County, that have slightly higher underserved scores. The region has the smallest low-income population and the highest income per capita in the State. About half of the population identifies as white, and the region has one of the smallest limited English-speaking populations. The region also has

overburdened scores in the middle percentiles, specifically for sensitive populations and pollution burden environmental effects indicators. There is a landfill located in each county and farming throughout the region. Half of the population is rural, so recycling access in this region should focus on expanding recycling infrastructure and programming across these rural areas, while also making sure that the expansion produces minimal pollutants.

Generally, the Upper Eastern Shore Region has EJ scores in the middle percentiles as well. There is an area in Cecil County that has lower EJ scores and a small area in southern Caroline County with higher EJ scores. The lower EJ scores in Cecil County are due to less sensitive populations close to the infrastructure surrounding the I-95 corridor and the higher EJ scores in Caroline County are related to agriculture and mining in the area. In general, the region is in the lower to mid percentiles for the underserved indicator and the middle percentiles for the overburdened indicator. It has a higher white population and is in the middle in terms of low-income and limited English proficiency in comparison to other regions of the State. Over half of the population is rural, so like the Southern Maryland Region, recycling access equitability should focus on expansion of services in rural areas, while minimally overburdening these rural areas with potential pollutants.

The Lower Eastern Shore Region has some of the highest EJ scores in the State. Most of the counties in the region are in the mid to upper percentiles of the underserved indicator. This region has the highest low-income population, the highest unemployment rate, and the lowest income per capita in the State. From an overburdened perspective, much of the region is in the mid to higher percentiles of the pollution burden environmental effects and sensitive populations indicators due to the farming and animal agriculture that is prevalent in the region. Most of the region's population is rural (42.6%), with pockets of urban populations making up over a third of the population, specifically around Salisbury and Ocean City. Recycling access in this region should expand into underserved rural areas and be developed in a way that does not disproportionally impact low-income areas with limited financial resources. Throughout the whole region, recycling services expansion should be designed to minimize negative impacts and unintended consequences on surrounding communities.

Statewide, the areas with the highest EJ scores are the urban parts of the Washington Metro and Baltimore Metro Regions and rural areas in the Lower Eastern Shore Region. Underserved and overburdened urban areas in and around Baltimore City, Washington D.C, and along the I-95 corridor consist of nonwhite populations that are impacted by urban pollution. However, from a recycling access perspective, there is a robust network of existing recycling collection and processing facilities in these areas of the State. Therefore, recycling equitability includes increasing participation in existing programs and optimizing recycling operations.

Underserved and overburdened rural parts of the State, specifically in the Lower Eastern Shore Region, highlight populations with less financial resources that are impacted by a lack of infrastructure and risk of exposure to potential pollution from mining, farming, and animal agriculture. For recycling equitability, services should be expanded in these rural areas to include more access to recycling infrastructure and programming that considers the challenges of rural environments and mountainous or water geography. Services should be designed to capture economies of scale so that programs and infrastructure

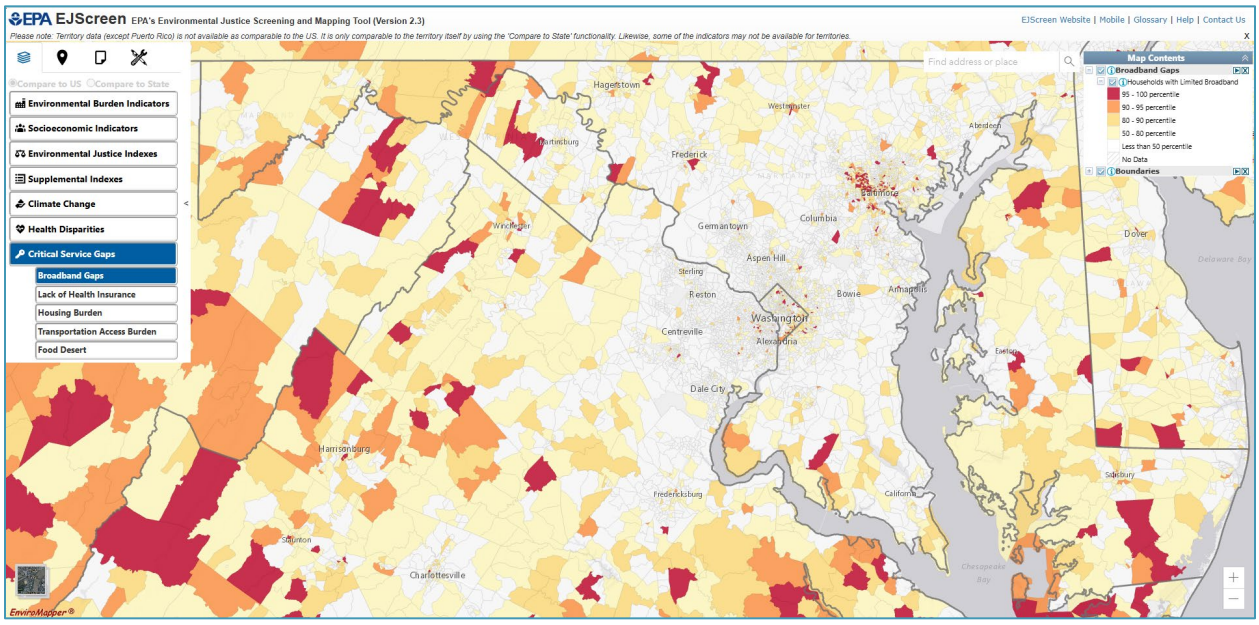
do not disproportionally impact low-income areas with limited financial resources. All recycling operations should also be enhanced or developed to emit minimal pollutants so as not to unduly overburden the communities in those areas.

3.1.2 EPA EJScreen

The EPA developed EJScreen as an environmental justice screening and mapping tool that provides the EPA and others with a nationally consistent dataset and approach for combining environmental and socioeconomic indicators. The tool uses Census block group datasets to highlight places that have higher environmental burdens and vulnerable populations. Unlike the MDE EJ Screening Tool, this tool does not calculate EJ Scores but instead provides various datasets that relate to factors contributing to environmental justice. These datasets include environmental burden indicators and socioeconomic indicators, as well as environmental justice and supplemental indexes that combine the environmental indicators with socioeconomic information. There is also data available within the tool related to climate change factors, health disparities, and critical service gaps.

For this assessment, this tool was used to gather datasets specifically related to limited English-speaking populations, unemployment rates, education and digital access. All these datasets have been incorporated into the previous sections of this report (**Section 2.4**, **Section 2.7**, and **Section 2.9**). **Figure 7** shows the broadband gaps data layer.

Figure 7: Broadband gaps layer on EPA's EJScreen Tool



This layer highlights block groups with the lowest rate of households with a broadband internet subscription.[25] According to the map, block groups in the Western Maryland and Eastern Shore Regions have the least access to broadband internet, whereas areas in and around Washington D.C. and Baltimore City have the most access to broadband

[25] EJScreen Map Descriptions, Environmental Protection Agency, https://www.epa.gov/ejscreen/ejscreen-map-descriptions#poll

internet. Data visualization in this manner can show useful solutions. For instance, in areas like the Western Maryland Region, methods of communication such as radio and television might be more effective than social media campaigns.

4 Key Findings

Below are the key findings of this report.

- **The Lower Eastern Shore Region has seasonal population fluctuations.** This region is the least populated in the State but offers a popular tourist destination in the warmer months since it is along the coast. These coastal destinations have higher urban populations than most of the rest of the region.
- **Most of Maryland's population is located in the Washington Metro and Baltimore Metro Regions, and the majority of that population is urban. The Western Maryland, Southern Maryland, and Upper Eastern Shore Regions have higher rural populations.** 82% of Maryland's population lives in the Washington Metro and Baltimore Metro Regions, making them the densest of the six regions. In the Washington Metro and Baltimore Metro Regions, most of the population is considered urban (63%+) and in the Western Maryland, Southern Maryland, and Upper Eastern Shore Regions, half or more of the population is rural. The Lower Eastern Shore region has a more equal distribution of the population between rural, suburban, and urban.
- **There are higher percentages of elderly populations in the Western Maryland and Eastern Shore Regions, where the majority of the population is considered rural.** The Western Maryland, Lower Eastern Shore, and Upper Eastern Shore Regions have the highest percentages of 65+ populations (20%, 21%, and 22%, respectively). These regions also have higher percentages of rural populations.
- **Washington Metro is the most diverse region where only two-thirds of the populations speaks English only.** This region has the highest percentage of limited English-speaking population, with Spanish being the highest alternative language spoken (16% of the population). Across all regions, Spanish is the second most spoken language (6%), followed by Indo-European languages (3%) and Asian and Pacific Islander languages (2%).
- **The Lower Eastern Shore and Washington Metro Regions have the highest percentages of multi-family housing and the Southern Maryland and Upper Eastern Shore Regions have the highest percentages of single-family housing.** The Lower Eastern Shore Region has the highest percentage of multi-family housing, making up 26% of the housing in that region. The Washington Metro Region follows closely behind at 24%. The Southern Maryland and Upper Eastern Shore Regions have the highest percentages of single-family housing at 91% in those regions.
- **The Lower Eastern Shore Region faces challenges related to less financial resources.** This region has the lowest per capita income ($35,638), the highest low-income population (33%), and the highest unemployment rate (6.5%).

- **Although the specific types of disabilities are unknown, the Western Maryland Region has the highest percentage of disabled people.** Western Maryland is part of the Appalachian region, which has higher rates of disability compared to the national average. The region with the lowest percentage of disabled people is the Washington Metro Region at 9.4% of the population.
- **The Lower Eastern Shore and Western Maryland Regions have the highest percentages of the population with less than a high school education.** The Lower Eastern Shore Region has the highest percentage of the population with lower education levels in the State (11.4%). This region is closely followed by Western Maryland (10.2%), Upper Eastern Shore (9.6%), and Washington Metro Regions (9.4%).
- **Rural and mountainous areas are more highly impacted by a lack of digital access.** Western Maryland has the highest percentage of the population with gaps in broadband (16.3%), followed by the Lower Eastern Shore (14.8%) and Upper Eastern Shore (14.4%) Regions. The Western Maryland Region is the most mountainous region of the State, and the Eastern Shore regions are some of the most rural.
- **Higher EJ scores in urban versus rural areas have different meanings and recycling needs.** Higher scores in urban areas in and around Baltimore City, Washington D.C., and along the I-95 corridor reflect higher diversity and nonwhite populations that are impacted by urban pollution. However, from a recycling access perspective, there is a robust network of existing recycling collection and processing facilities in these areas of the State. Higher EJ scores in rural areas, specifically in the Lower Eastern Shore Region, highlight populations with less financial resources affected by challenging geography and limited access to recycling infrastructure.

5 Recommendations

Below are recommendations based on the above key findings.

- **Plan for seasonal population fluctuations along the coast of the Lower Eastern Shore Region.** Seasonal population and tonnage fluctuations will require customized capacity planning, contamination monitoring, and education for transient populations in regions for a more prominent tourism economy. In areas of tourism during the off seasons, customizable recycling collection schedules and resources should be available for full-time residents.
- **Increase recycling participation in the regions in central Maryland and expand recycling infrastructure in rural parts of the State.** There are robust existing recycling collection and processing networks in the Washington Metro and Baltimore Metro Regions, where most of the State's population is located. Therefore, recycling operations in these areas should be enhanced to increase participation in existing programs. In the remaining regions of the State, where there are higher rural populations, recycling operations should focus on expanding access to recycling infrastructure and programing that considers the challenges of lower annual tonnage generation, rural environments and mountainous or water geography.

- **Include accommodations for the elderly in recycling collection and program design, especially in rural areas.** Recycling collection service in regions with a high percentage of elderly populations should developed to provide additional technical assistance, education, and outreach services to meet the needs of elderly populations, especially in rural areas.
- **Translate recycling outreach materials into multiple languages.** Educational materials and outreach plans should be translated into Spanish (at a minimum), with options for additional languages based on the region.
- **Provide multiple methods of recycling collection to alleviate barriers and increase capture of recyclables.** Regions with more single-family households will require more cart-based curbside services, and regions with more multi-family housing will need more support to increase recycling capacity (e.g., additional compactor, dumpsters, enclosures, etc.) and provide additional options for drop-off stations.
- **Design recycling services to capture economies of scale.** Specifically in the Lower Eastern Shore Region, recycling programs and infrastructure should not disproportionally impact low-income areas with limited financial resources.
- **Research the specific disabilities prevalent in a region or community.** Disabilities throughout the population in each region should be better understood to prevent barriers to recycling and to create a more inclusive recycling system at current and future infrastructure that may be developed.
- **Create recycling outreach programs that do not rely on access to the web.** Other recycling educational outreach programs besides those available online should be considered for regions with gaps in broadband connectivity. Elementary and middle schools can be used to spread recycling education as well as places of worship and other locations where communities gather.
- **To increase equitable outcomes for recycling in urban versus rural areas, structure recycling programs according to the needs of the community.** In underserved and overburdened urban areas where there are already strong recycling operations present, recycling equitability includes increasing participation in existing programs and optimizing recycling operations in these areas to emit less pollutants, to make working conditions safer, and to decrease fire risk. In underserved and overburdened rural parts of the State, recycling services should be expanded to include more access to recycling infrastructure and programming that considers the challenges of rural environments and mountainous or water geography. Achieving the highest possible level of performance improvement in a potential EPR for packaging program requires addressing any existing equity disparities. Crafting a strong equity narrative that provides the opportunity for underserved and overburdened communities to engage meaningfully in the program would strengthens the program's overall effectiveness and inclusivity.
- **Services should be designed to capture economies of scale so that programs and infrastructure do not disproportionally impact low-income areas with limited financial resources**. All recycling operations should also be enhanced or developed to emit minimal pollutants so as not to unduly overburden the

communities in those areas. In general, recycling system upgrades, including collection programs, processing facilities, drop-off, and transportation, should not unfairly impact underserved or overburdened areas.

- **There are various approaches to incorporating equity in the future of the State's recycling system including vehicle route optimization, transitioning to clean fleets, and establishing and promoting employment opportunities.** Vehicle route optimization can minimize noise, air pollution, and traffic disruptions in EJ communities. Transitioning to clean burning fuel including compressed natural gas or electric vehicles can minimize tailpipe emissions. Creating job training programs for local residents, focusing on positions like truck drivers, mechanics, and logistics planners can support recycling collection and processing systems.